ANNUAL REPORT
OF
PROGRAM ACTIVITIES

DIVISION OF RESEARCH GRANTS
DIVISION OF RESEARCH SERVICES

FISCAL YEAR 1971

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE NATIONAL INSTITUTES OF HEALTH

ANNUAL REPORT

of

PROGRAM ACTIVITIES

.S. National Institutes of Health. DIVISION OF RESEARCH GRANTS

DIVISION OF RESEARCH SERVICES

Fiscal Year 1971

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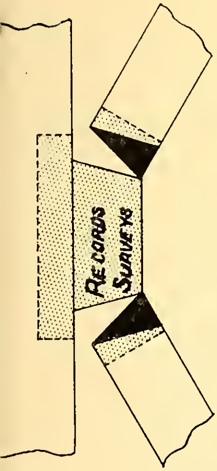

DRG

DRS

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SUMMARY

The Director and Deputy Director continued close contact with the scientific community and grantee institutions by participation in a variety of scientific and national organization meetings held during the year.

The DRG continued to be responsible on behalf of all the health agencies of the DHEW in implementing the policy on protection of human subjects. This policy and the Division's assignment was broadened to include all DHEW agencies, and expanded to include all subjects at risk. The establishment of regional meetings with representatives of grantee institutions has proved to be a most successful method for disseminating information to major grantees and contractors responsible for implementing the policy on protection of human subjects at risk, and to gain an understanding of their problems and concerns in following our policy and procedures. Prior approval authority, normally retained by the Public Health Service, has now been given to 128 grantee institutions.

The Research Grants Review Branch experienced its heaviest workload since 1965, processing 21,662 competing and noncompeting applications, and taking on added responsibilities, including many specialized programs that required special handling and creation of new procedures. In contrast, there was a 14.5 percent decrease in training applications of all types during the first three quarters of fiscal year 1971, compared with that same period last year.

A study section for population research has been approved to review the growing number of applications now being received in that field, bringing the number of study sections to 52.

Responsibility for review of postdoctoral and special fellowship applications was transferred to the awarding unit training committees, and initial scientific merit review of all new and renewal research career development award applications was gradually passed to the study sections.

Because of many concerns on the various procedures used by the institutes to interrelate priority scores of applications reviewed by the various study sections, a Priority Score Review Committee was established to study the use of the initial review group priority scores. It recommended a standard system for all NIH components that normalizes each application score. This system becomes effective July 1, 1971.

During the year, the study sections organized 13 workshops and conferences in a variety of fields including, among others, nutritional anemias, sickle cell disease, bioengineering problems of the spine, and achievements in minority groups.

In March 1971, agreement was reached between DRG and the Bureau of Health Manpower Education to enter (beginning with fiscal year 1972) all BHME programs other than the scholarship, loan, and construction programs into the NIH IMPAC system, on a current rather than a year-end basis.

A major modification to the scientific classification code structure of the IMPAC System was implemented this year. Using this new code, research grant and research career awards are now coded by the executive secretaries of the Research Grants Review Branch.

Procedures for a comprehensive computer system for the Research Grants Index were completed and put into operation for computer storage, and automatic search and retrieval of scientific information about research projects currently supported by the Public Health Service.

The Grants Associates Board was extended this year to include a representative of the Health Services and Mental Health Administration.

In the hope of promoting better communication between DRG employees, the Division established "Project Dialogue" through which employees meet in groups during lunch periods and in the evenings to learn a choice of arts and crafts, play bridge, or attend demonstrations of hobbies, such as mineral collecting.

In addition to her counselling duties, the EEO Counsellor has been actively involved in the meetings of the Women's Action Program insofar as they relate to the NIH equal employment opportunity program.

The Division has participated in a continuing program for training of supervisors and managers, and many employees took advantage of a variety of training courses offered by NIH during the year.

The Training Opportunity Program (TOP) Committee extended its area of interest beyond training, for which management is now assuming responsibility, to employee problems and equal employment opportunity. The Director has therefore appointed it as the DRG EEO Committee, and as his reviewing committee for EEO Awards.

Several major publications were issued during the year including, the third edition of the Medical and Health Related Science Thesaurus; the tenth edition of the Research Grants Index, a revised edition of the NIH Central Scientific Classification Code; a brochure, National Institutes of Health Grant Programs for Training and Education, and revised editions of the Orientation Handbook for New Members of Study Sections, and a leaflet entitled, Review Procedures.

OFFICE OF THE DIRECTOR

The Director, Division of Research Grants, has maintained close contact with the scientific community and the grantee institutions through attendance at a number of meetings including the annual meetings of the National Council of University Research Administrators, Washington, D.C., November 16-17, 1970; the Association of American Medical Colleges, Los Angeles, California, October 29-November 2, 1970; the Council of Graduate Schools, Miami Beach, Florida, December 2-4, 1970; and the Western Association of Graduate Schools, Newport Beach, California, February 28-March 2, 1971. The Director also attended the meeting of the Business Officers Section of the Western Region of the Association of American Medical Colleges, Albuquerque, New Mexico, January 27-30, 1971.

The Director presented papers at the National Science Foundation orientation for NIH Grants Associates on July 21, 1970; at the Association of Independent Research Institutes, Boston, Mass., on September 24-25, 1971; at the Grants Associates Seminar in Bethesda, Md., on February 22, 1971, and at the Business Officers of Northeast Region of the Association of American Medical Colleges, Hyannis, Mass. on May 5, 1971.

The Director also attended the Federal Management Improvement Conference in Washington, D.C., September 21-22, 1970, and the NIH Director's meeting with institutes and divisions at Belmont, Maryland, March 5-6, 1971.

As part of his program to establish improved communications between members of the DRG staff, the Director and Deputy Director hold weekly "brown-bag" luncheon meetings with (a) top echelon staff, and (b) executive secretaries. The Director also participates in Project Dialogue, launched in 1970 following the Airlie House DRG/EEO Conference in the hope that sharing of common interests might promote better communication between DRG employees. Initially, 72 persons expressed an interest in hobbies and crafts and 18 volunteered to teach. Handcraft courses of many kinds were started in response to staff demand and are still continuing. German and Spanish are being taught to language enthusiasts, a bridge group meets almost daily during the lunch hour, and demonstrations have been given in such diverse interests as cake decorating and mineral collecting.

Shortly after the courses commenced, a Craft and Hobby Show was organized which attracted almost 1,000, including those from buildings other than the Westwood Building.

In his capacity as Acting Associate Director for Statistics, Analysis, and Research Evaluation, the Deputy Director, DRG, attended a briefing in Poughkeepsee, New York, in December 1970, on the IBM 370 computer system to be installed at NIH in the near future. He also attended the Bell System Business Communications Seminar in New York on February 24-26, 1971.

The Acting Associate Director serves as Chairman of the NIH Subcommittee for Statistics of the ECEA; represents the Division of Research Grants on the Advisory Committee for Program Planning and Evaluation, and is a member of the Data Subcommittee of that group. In his capacity as Deputy Director, he is a member of the Advisory Committee on the Training Study conducted by the Office of Program Planning and Evaluation, OD/NIH, and of the Steering Committee to direct the Study on the Administration of NIH Fellowship Programs. He also serves as principal alternate to the Director in all aspects of the Division's operations.

DRG's Equal Employment Opportunity Counsellor participated in a number of meetings, including a special meeting on February 26, 1971, at NIH of the ad hoc steering committee of the NIH Organization for Women; a planning session at DHEW of the DHEW Employee Group held on March 1, 1971, for a special meeting with the Secretary, DHEW; a 1-day meeting on March 9, 1971, of the DHEW's Women's Action Program and the Women's Bureau to explore ways to meet the commitments to the Federal Women's Program, the President's Task Force on Women's Rights and Responsibilities, and the recommendations of the HEW ad hoc Group of Women; the Federal Training Officers Conference held at George Washington University Club, March 24, 1971; the Regional Health Careers Conference, North Carolina Central University and Duke University Medical Center, Durham, North Carolina, on April 12-15, sponsored by the Bureau of Health Manpower Education, NIH, to attract, recruit, counsel and retain black students in health professional careers; and sat on the Quality Review Board for the NIH Federal Women's Coordinator, which met on the afternoon of May 13, and all day on May 17.

The EEO Counsellor also attended a course in advanced equal employment opportunity counselling conducted by the Bureau of Training, Personnel Management Training Center, U.S. Civil Service Commission on April 7-9, 1971.

In addition, the EEO Counsellor has counselled almost 300 Division employees in problems that have arisen during the past year, successfully solving the great majority of them by ironing out misunderstandings or, in a few cases, by transfers to more congenial positions.

A post-Airlie House conference survey of recent, current, and pending training programs offered by DRG to its employees indicated that lack of employee-awareness of opportunities was the most serious deficiency. DRG's Personnel Office has been instrumental in publicizing the availability of employee training programs either by memoranda to the staff or announcements on bulletin boards and in the DRG Personnel Items.

In review, DRG employees attended 449 individual training assignments supported by NIH during the year. This is significant of employee interest in development of their skills and desire for further knowledge.

The most popular courses have been in computer training conducted primarily by the Division of Computer Research and Technology, which attracted 202 individuals who wanted either to have a basic course in data processing techniques, or to improve the skills they already have. Courses in typing and shorthand were taken by 54 employees; by 44 in reading and writing improvement; 42 in mailing procedures; 23 in secretarial training; and 19 in business English. Ten employees took advantage of the Montgomery County Adult Basic Education courses.

There has been a continuing program for training of supervisors and managers within DRG and NIH, as well as the Civil Service Commission and non-Government facilities. To ensure that employees are aware of the training opportunities available to them, emphasis has been placed during these sessions on the responsibility of supervisors to keep their employees advised of training opportunities, and they have been encouraged to watch bulletin boards for announcements of forthcoming training sessions of interest to them.

A course in human relations is currently in progress for a selected group from middle management.

The Training Opportunities Program Committee (TOP) has laid much of the groundwork for management to assume the training functions of the Committee. This past year, the Committee's areas of interest have extended beyond training, and into employee problems and equal employment opportunity (EEO). The functions of the Committee have therefore changed, and with this in mind, the Director has appointed TOP Committee the DRG Equal Employment Opportunity Committee. The new duties of the Committee have not yet been completely defined, and as of now the name remains unchanged.

In November 1970, a subcommittee was appointed, with the addition of three additional DRG employees, to develop a DRG orientation program for old and new employees, a program first suggested by the TOP Committee in March 1970. The subcommittee has just about completed its work. There has been a trial orientation "run," and a DRG Employee Handbook is in preparation for publication.

The Committee held several meetings with the Personnel Office staff to consider the feasibility of publishing a pamphlet describing the duties of the Personnel Office as they relate to the employees and to management.

The Committee has been unable, because of the pressures of everyday DRG work obligations, to make any additions to date of its series of "Dead End" pamphlets.

The Committee made a survey for the DRG Executive Officer on the career and training needs of the black employees in the Division. Some white employees were included in the survey for comparative purposes.

The Director has also appointed the TOP Committee as his reviewing Committee for EEO awards. Operating guidelines are in course of preparation.

Institutional Relations Section

Activities of the Section have been centered on the revision of the PHS policy on the protection of human subjects, and the broadening of its coverage to include all agencies of the Department. PHS policy protected only those human subjects involved in research. The DHEW policy has been expanded to include subjects at risk in all projects and activities supported by DHEW.

The policy, which forms Chapter 1-40 of the Grants Administration Manual, was prepared by the Section at the request of the Office of Grant Administration Policy. Grantee administrators will be notified of changes in the provisions for institutional assurances. NIH implementation is being developed.

DHEW funds for grants, contracts, or awards involving human subjects at risk will be given only to institutions who have negotiated acceptable assurances that they are complying with the requirements of the policy. Institutions may choose a "general" assurance, which covers all of their DHEW-supported activities, or a "special" assurance. The special assurance format has been developed for those institutions that have one or a few projects involving human subjects. The number of institutions included in the cumulative list of applicant institutions and contractors with institution-wide (general) assurances is being reduced from about 1,900 to approximately 800.

Regional meetings with representatives of grantee institutions were held in Syracuse, New York, and Minneapolis. These have proved to be a successful mechanism for disseminating information to major grantees and contractors responsible for implementing the policy. The attendees generally have been chairmen of institutional committees responsible for local review of proposals, institution officials, representatives of the Office of General Counsel, PHS programs and the Regional Offices concerned. Discussions have dealt with such problems as obtaining informed consent, determining the risks-benefit ratio, and maintaining committee contact with investigators as studies progress.

Identification of "problem cases" has been an important aspect in the administration of the policy. A number of these projects do not conform to the policy because of their failure to recognize what constitutes an informed consent statement in the protection of the subject. In other instances, a clarification is necessary as to what is included in the phrase, "the use of human subjects."

A pilot study is underway to improve institutional control in the submission of PHS application forms for the renewal and continuation of research grant support. Three institutions are participating in the initial phase of a study on the feasibility of routing all renewal and continuation application forms through one institutional control point. Additional institutions are being invited to participate in the next phase of the study.

The Institutional Relations Section is responsible for selecting and preparing material published in the DRG Newsletter. The content of the publication has been broadened to include information on research and development sources sought by NIH contract programs and on available requests for proposals

The Section publishes quarterly the "Notice of NIH Conferences," for internal distribution. The publication lists pertinent information about scheduled conferences and follows with brief summaries after their completion.

Authority has been given to 128 institutions to assume certain prior approval authority normally retained by the Public Health Service. During the last year, this program has been held essentially static awaiting proposed changes in Federal policy on grant management. Two institutions have been dropped from the list for lack of sufficient grant activity. Another has been denied admission for failure to provide satisfactory answers to audit criticisms of grant management activities related to the exercise of prior approval authority.

Information Section

More than 18,000 copies of various publications were mailed by the Information Office staff in response to requests; more than 4,000 inquiries were answered either by telephone or letter, of which 11 came directly from the press and 58 from the Congress. The staff received 71 visitors, prepared 43 press releases, three papers, 10 reports, and 28 articles.

A brochure, National Institutes of Health Grant Programs for Training and Education, compiled in the Career Development Review Branch, DRG, was edited and prepared for publication by the Information Office staff. Because of an inferior job by a GPO contractor, the original printing had to be abandoned and a fresh start made by the Government Printing Office to produce an acceptable document. The publication became available in May.

An updated version of the pamphlet, Organization and Functions, Division of Research Grants, was distributed in April 1971, and similar information supplied to the Office of Information/OD for the 1971 edition of the NIH Almanac. Forewords, prefaces, and introductions were prepared for the FY 1970 Public Health Service Grants and Awards publications.

The Information Office staff continued to review and edit the monthly IBM listings of new grants and awards to clarify confusing or nebulous project titles and to ensure completeness of information. Research contracts awarded during fiscal year 1970 were included in these listings for the first time since publication of the lists was initiated in November 1957.

The staff continued to prepare, publish, and distribute the DRG Personnel Items each month, and to compile material provided by the Institutional Relations Section, DRG, for the DRG Newsletter, prepare the lay-out, and distribute the document to interested members of the scientific community, the general public, and Public Health Service components. There has been a marked increase in demand for the DRG Newsletter. The mailing list now totals 1459 addressees.

A revised edition of the Guide to Grant and Award Programs of the National Institutes of Health became available for distribition soon after the 1970 Annual Report was submitted. Because of the restriction on publications, plans to update the Review and Approval Procedures booklet last summer were abandoned until the financial climate becomes more favorable.

The Information Officer contributed to the preparation of two papers for presentation by the Director, DRG, one on the panel review system before the U.S. Pharmacopeial Convention, Inc., and the other on the general structure and purpose of the National Institutes of Health and the research grants program, at Florida State University, both in April 1970 and not reported last year. The Information Officer also assisted in the preparation of a radio script on the NIH extramural programs.

The Information Officer served on the NIH Information Intern Training Committee during the year, and on the subcommittee responsible for the organization of seminars for mid-level information personnel. Senior members of the Information Office staff attended the seminars.

The Assistant to the Information Officer served on the NIH Day Care Committee during its initial fact-finding sessions, and as the DRG Recreation and Welfare Representative for the 1970-1971 calendar year.

Grants Associates Program

The Grants Associates Program enjoyed a productive year graduating seven associates, all of whom remained in Government service; six within the Public Health Service. It is estimated that the full authorized level of 10 associates will be in training early in fiscal year 1972. This slow growth has been a reflection of the high standards of selection rather than any lack of applicants. The straited condition of academic research has motivated a significant increase of interest in the program even though entry-on-duty dates are projected a year in advance.

A comparison of the last 2 fiscal years reveals that during fiscal year 1971, 177* applications were received compared with 148 in fiscal year 1970; 46* applicants were interviewed compared with 26 in fiscal year 1970, of whom 13* were invited to join the program compared with 10 in fiscal year 1970.

Both the Grants Associates Board and the Civil Service examining panel have noted an overall increase in the quality as well as the quantity of applicants. To maximize the benefits of those highly qualified applicants not invited to join the program, the Grants Associates Office has developed an extensive secondary placement system. This has resulted in the direct hire employment of numerous individuals with particular emphasis on minorities and women.

In its continuing evaluation and refinement of selection criteria, the Grants Associates Board has developed a set of factors to which the Civil Service Panel has difficulty responding. Fortunately a long and close relationship between the two has created a climate in which new relationships are being constructively explored.

The composition of the Grants Associates Board was changed in one important respect with the appointment of an additional member from the Health Services and Mental Health Administration. The Executive Secretary's position was assumed by a new incumbent after a 3-year term by his predecessor. The new Executive Secretary will fill an expanded function as staff support to both the Board and the Committee for Staff Training Extramural Programs (STEP).

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*estimated to end of fiscal year 1971

CAREER DEVELOPMENT REVIEW BRANCH

The Career Development Review Branch has continued its responsibility for the development of proposals for the modification of the training programs through a series of individual program analyses. The staff has provided the various offices in DHEW and NIH with statistical reports and studies, such as Training Data for NIH Training Grants, 1965-1968; Federal Predoctoral Student Support, Part II, FICE; NIH Support of Black Colleges, FY 1970.

Receipt of all types of applications for training, both research and service, during the first three quarters of this fiscal year declined from 10,720 to 9,165, a decrease of 14.5 percent. Most of this can be accounted for by the demise of the predoctoral research fellowship program, which was discontinued during fiscal year 1971. New predoctoral applications submitted for the October 1, 1970, deadline were not accepted, and in addition, funds for the continuation support of any predoctoral awardee beyond June 30, 1974, will not be obligated. Approximately 32 percent of all applications have been directed to HSMHA and EPA.

Limiting receipt data to those applications that require assignment, i.e. new and renewals, changes were as follows: fellowships, 37 percent decrease; research career (NIH) and research development (HSMHA) programs, 4.5 percent decrease; training grants, 13.2 percent decrease. Total decrease in receipt of all applications requiring assignment for the 9-month period amounted to approximately 30 percent.

The distribution of applications processed between April 1970 through March 1971 is shown in the table on the following page.

With the phasing out of the predoctoral program, the responsibility for the review of postdoctoral and special fellowship applications was transferred to the awarding unit training committees. The Branch has continued to be responsible for the receipt, assignment, administrative review, processing and duplication of the postdoctoral and special applications.

The Assistant Chief (Fellowships) continued to represent the NIH at the Federal Interagency Chemistry Representative's meetings.

NIH Research Fellowship Announcements (September 1970) for the postdoctoral and special fellowship programs have been revised and will be distributed to academic officials by September 1971. The revisions were made for general refinement, but the major item was the change of the April 1 deadline to June 1 for the receipt of applications.

The NIH Research Fellowship Program Administrative Guide, which provides assistance to the awarding units and the staff and personnel of fellowship sponsoring institutions, has undergone major revision and incorporates several policy changes made since July 1968. The revised guide will be distributed by September 1971.

The Reference Data Book on NIH Research Fellowships FY 1970, which

APPLICATIONS RECEIVED IN CDRB
TRAINING GRANTS, RCPs, and FELLOWSHIPS
April 1970 through March 1971

COMPETING - Types 1, 2, 3

	TG	RCP	FE	TOTAL
NIH	968	564	2877	4409
HSMHA	562	108	955	1625
EHS (EPA)	92	0	51	143
FDA	2	0	0	2
TOTAL	1624	672	3883	6179

NONCOMPETING -- Types 4, 5

	TG	RCP	FE	TOTAL
NIH	1910	866	1364	4140
HSMHA	1693	159	262	2114
EHS (EPA)	75	0	1	76
FDA	8	0	0	8
TOTAL	3686	1025	1627	6338

TOTALS

(All Components)

Competing	6179
Noncompeting	6338
GRAND TOTAL: April 1970 through March 1971	12517

summarizes various aspects of the fellowships programs, was revised for this fiscal year's operations. The coverage of materials in this publication has been broadened to include reports previously issued on an individual basis. The Data Book can now be used as a statistical source in this program. For example, 5,560 fellowship applications (2,134 predoctoral, 2,220 postdoctoral, and 1,206 special) were received and processed during FY 1970. Of this total, new and noncommitted renewal applications (requiring CDRB primary review) amounted to 4,095.

Wide distribution has been made of the new NIH policy decision concerning dependency allowances, which states: "Postdoctoral Research Fellows must notify the awarding unit of changes in number of claimed dependents in writing prior to the activation date of either the initial award or any subsequent continuation awards. No changes in dependency allowances will be made for acquired dependents or dependent deletions during any single award period. The allowance will be determined de facto as of the award activation date."

A new informational statement has been developed to aid the institute training committee members in their review of NIH research fellowship applications. The statement briefly describes the establishment and function of the committees within the NIH institutes and divisions, the support provided by the Career Development Review Branch, Division of Research Grants, and the methods and techniques of the review process.

The Research Career Program Coordination Section processed 444 new and renewal applications (competing) and 889 noncompeting applications during the first 9 months of the current fiscal year. These included the applications of the National Center for Health Services Research and Development, Health Services and Mental Health Administration.

New procedures for the processing and administrative review of the new National Heart and Lung Institute pulmonary academic awards (K-07) were developed in cooperation with the National Heart and Lung Institute staff.

Beginning with the October 1, 1970, deadline, the National Heart and Lung Institute became the third institute using the study sections of DRG for the scientific merit review of their applications. Starting with the May 1, 1971, deadline, all new and renewal RCDA applications will receive the initial scientific merit review by the appropriate study section.

The Associate Director for Extramural Research and Training was provided with a staff paper on Research Career Development Awards; the following recommendations ultimately led to major modifications in the RCDA awards:

(1) After June 30, 1972, no new renewal awards be made.
(2) The period of the award be a single support period of 5 years.
(3) That the award be nontransferable.

Announcements to the field were developed and mailed out to all people concerned.

An ancillary report dealt with the approval and award rates of the new RCDA (K-4) awards as compared to the old RCDA (K-3) awards for the period of FY 1969, 1970, and 1971.

In addition, in cooperation with the NIH Policy and Procedure Officer, NIH Manual Issuance 4505 entitled, "Responsibility for Review of Research Career Development Awards and Their Duration," was prepared and made a formal NIH policy on March 12, 1971.

Beginning with fiscal year 1971, this Section has initiated the RCP Monthly Status Report which highlights the major items of interest regarding the research career program. It is distributed to the Office of the Associate Director for Extramural Research and Training, and the institute RCP program administrators.

A new policy on salary participation (supplementation) by grantee institutions was announced by NIH and became effective on May 1, 1969. Since that date a 1-year study was conducted to determine to what extent institutions have supplemented the salaries of NIH research career program awardees. The data show that 292 requests have been received, of which 99 percent of the research career development awardees (K-3 and K-4) who received from NIH the maximum contribution of $25,000 per year are having their salaries supplemented by the grantee institution. In a similar situation, 91 percent of research career awardees (K-6) receiving $25,000 per year from NIH are having their salaries supplemented. The requests range from $200 to $18,800. The approximate average total annual salary was calculated to be $29,000.

The Training Grants Coordination Section processed 5,057 training grant applications during the last 12 months (April 1970 through March 1971). Of these proposals, 2,615 (almost 52 percent) were assigned to the awarding units of the NIH. Applications assigned to the National Institute of Mental Health accounted for the major share of the remainder, totaling 2,140, 42 percent of the total. Almost a third, 1,614 of the applications were competing proposals for new, renewal or supplemental grants. Approximately 700 new applications were logged along with 700 renewals and 200 supplementals.

As in the past few years, the Branch developed during this period various reports and analyses concerning the overall NIH training grants program. These studies usually are included in the CDRB Reports series and are distributed to NIH officials on an "as needed" basis. Several of the reports prepared during the past year have covered 3 years of data in an attempt to detect chronological trends. Among the reports were the following:

Training Grant Unexpended Balances as a Proportion of the Total Programs Research Institutes, FY 1968-FY 1970;

Costs Shown on Continuation (Type 5) Awards for Graduate Training, NIH Research Institutes, FY 1968-FY 1970 (CDRB Report No.71-4);

Trainee Appointments under Graduate Training Grants, Research Institutes, FY 1967-1969 Funds (CDRB Report No.71-5);

Trainee Appointments Showing Support from "Other Sources" (Including Stipend Supplementation), FY 1967-1969 (CDRB Report No.71-6);

Personnel Costs on Training Grants to Schools of Medicine, Dentistry and Osteopathy, FY 1970;

Trainee Costs on Statements of Appointment, Graduate Training Grants, NIH Research Institutes, FY 1967-1969.

In addition to these reports, the Branch has continued to respond this year to numerous requests from various intramural and extramural sources for summary information concerning training grants. As an example, the Branch provided data to the Office of Program Analysis, OADPPE, OD, in connection with a response to a request from OMB for information regarding institutional or departmental support vs. direct trainee support under NIH training programs. The data provided by CDRB showed the distribution of the funds by cost category on NIH training grants for the fiscal years 1968, 1969, and 1970.

The Assistant Chief, Training Grants, chaired a committee which revised the application form for noncompeting (type 5) training grants. The new form is designed so that it can also be used for research grant continuation applications, thereby enabling NIH to reduce the number of different forms in use. It is expected that this improvement will be welcomed by the grantees also. The committee has also developed an annual progress report form to be used for training grants. A standard form for this purpose has not previously been in use at NIH. Instead, training grant progress reports have followed formats suggested by each awarding institute/division, and in some cases were a part of the continuation application.

A new brochure, National Institutes of Health Grant Programs for Train-and Education, was published and made available during the year. This is a revision, compiled by CDRB, of the previous brochure, Training Grant Programs of the Public Health Service, but outlines the programs of support offered by the institutes and divisions of NIH only. Information is included on the purpose, eligibility, and the types and amount of financial assistance characterizing each program, as well as an address for requesting additional information.

RESEARCH GRANTS REVIEW BRANCH

In carrying out its major responsibilities for the receipt, assignment, and scientific review of research grant applications, for the survey of the status of research in areas related to those of the initial review groups, and for the stimulation of research in areas of biomedical interest that have been neglected or in which there is need for expansion, the Research Grants Review Branch experienced one of its heaviest workloads in fiscal year 1971.

The Branch processed 21,662 competing and noncompeting applications during the year. Of these approximately 11,927 were assigned for technical merit review. Approximately 74 percent of the competing applications received were assigned to the NIH, and of these more than 80 percent were given initial scientific review by the Branch. The drop to 80 percent from 90 percent in 1970 most probably resulted from the special "SCOR" program, the Medical Library Resource program, and similar programs.

The table on the following page shows the distribution of applications processed this year.

Added responsibilities have come to the Branch during the past year, which have increased the workload and deadline pressures in the Referral Office of the Branch as well as in the study sections. Specifically, the following functions and activities have been added: (1) Many specialized programs have recently been initiated; for example, the SCOR program of the National Heart and Lung Institute, the clinical allergy centers program of the National Institute of Allergy and Infectious Diseases, and, on the horizon, the spinal cord injury program being launched by the National Institute of Neurological Diseases and Stroke. Applications for each of these programs require special handling and the creation of new procedures. The Branch has been asked to review applications for the Veterans Administration, and once again, new and different procedures had to be developed. (2) Several new continuing programs have been started; for example, the special dental research awards program of the National Institute of Dental Research, the resource related research projects program of the Division of Research Resources, the resources improvement grant and resources project grant programs of the National Library of Medicine. Some of these also require new procedures. (3) The Branch has been given responsibility for referral and some other aspects of the research career program awards. (4) Executive secretaries have been given the responsibility for assignment of the scientific classification to applications for entry into the NIH central scientific classification system. (5) Since the History Card Section, formerly in the Financial Management Branch, was abolished, the Branch has been serving more and more as a PHS information center. (6) The DRG mailroom has been incorporated into the RGRB Referral Office.

To accommodate these new responsibilities, many changes in procedures have been made and more changes, including reorganization of the Referral Office, are being considered.

A new study section, the Population Research Study Section, has been

APPLICATIONS PROCESSED BY REFERRAL OFFICE, RGRB
Fiscal Year 1970: March 16, 1970 - March 15, 1971

COUNCIL		NOV.70	MAR.71	JUNE 71
		COMPETING		
Types 1, 2, 3	NIH -	2655	2709	3458
	HSMHA -	654	564	908
	EHS -	172	211	230
	FDA -	51	54	54
TOTAL		3532	3538	4650
Construction		43	23	14
PL 480		8	4	8
Career Development		27	46	34
Subtotal		3610	3611	4706
		NONCOMPETING (All 3 PHS components)		
Type 5		3397	2865	2292
Interim-Regular & Cross Fiscal		366	498	317
Subtotal		3763	3363	2609
		TOTALS (All 3 PHS components)		
Competing		3610	3611	4706
Non-competing		3763	3363	2609
TOTAL		7373	6974	7315

Grand Total for FY 1971 (Competing and Noncompeting) 21662 approved and is being organized as a regular study section to review the large number of applications now being received in this field. Proposed studies include sociological, epidemiological-demographic, psychological methods and those of other social sciences, and involve goals of assessing attitudes, interventions, and surveys focused on population research.

During the year, the Branch, concerned about the various procedures being used by institutes to adjust priority scores of applications reviewed by study sections, formed a committee to look into the normalization problem and make recommendations. The outcome was a proposal suggesting a uniform normalization procedure to be used throughout NIH. The proposal is presently under consideration.

A booklet, Orientation Handbook for New Members of Study Sections, and a leaflet, Review Procedures, were revised this year. New material on the numerical rating procedure and a diagram of the priority rating scale contained in Review Procedures have been very helpful. Both revisions were made available to all NIH institutes and divisions.

The Branch Chief again had a number of NIH-wide assignments related to the extramural programs. He was appointed as one of the two DRG representatives on ECEA, and served on committees concerned with the development of NIH Manual issuances and with the revision of PPO's. He also continues to serve as the NIH representative to the Division of Chemistry and Chemical Technology of the National Research Council. Members of the Division had expressed concern over NIH's role in the support of chemistry. They requested information, which was supplied through a number of reports. A meeting was then arranged between a committee of this Division of the National Research Council and representatives of the Office of the Director, NIH, in which the role of NIH in the support of chemistry was clarified.

In recognition of his outstanding performance and his overall program contributions to DRG and NIH, Dr. Raymond J. Helvig, Surgery A Study Section, was awarded the commendation medal for PHS commissioned officers.

Dr. George N. Eaves, on leave from the position of executive secretary, Molecular Biology Study Section, received a fellowship from Rockefeller University for a year of specialization in medical writing and editing.

Study sections sponsored and organized a number of workshops and conferences to survey the status of research in their areas, enhance the review competence of their reviewers, and stimulate research in neglected areas.

During the past year, as a follow-up of a meeting held last year on the subject of biological hazards, the Virology and Genetics Study Sections continued to discuss their concerns about this matter. After the January meetings of both Study Sections, recommendations were sent to the Chief, Research Grants Review Branch concerning how this matter should be handled in the scientific review of research grant applications. A memorandum was forwarded to the Associate Director for Extramural Research and Training, NIH, recommending that study sections, in reviewing research grant applications, advise of any potentially hazardous biological material or hazardous instrumentation and that this be noted on the summary statement for use by staff in the appropriate institute. This recommendation was accepted by the Associate Director for Extramural Research and Training, NIH, and guidelines are currently being developed to implement this beginning with the September 1971 round of study section meetings.

Two workshops planned during fiscal year 1970 were held in September 1970. The Franklin C. McLean Commemorative Workshop Conference on cellular mechanisms for calcium transfer and homeostasis, sponsored by the General Medicine B and Dental Study Sections, the Easter Seal Foundation, and the Atomic Energy Commission, was held September 13-16 in Portsmouth, New Hampshire. The conference was considered fruitful and brought together about 180 scientists from a number of disciplines who share an interest in the functions served by calcium in a variety of tissues, and the cellular mechanisms by which the calcium ions enter and leave them. Included among the participants were the younger, less well-known investigators who provided fresh and provocative approaches to the problems under discussion. Presentations and discussion covered: calcium in the body fluids of living organisms, including the theory of nucleation, differentiation processes in calcified tissues, calcium binding to nucleic acid and phospholipids, sialic acid, and mucoprotein; the role of calcium in membrane structure and integrity including mitosis; calcium transfer across cell and subcellular membranes, such as the red blood cell and kidney cells in culture; cellular mechanisms in mineralized tissues including bone membranes, bone cells, cartilage, and osteocyte function; transfer of calcium across epithelial tissues, including the gut and calcium-binding protein, the gut cells, lactation, the uterus of the hen, and the formation of egg shell; the sites and modes of action of humoral factors such as parathyroid hormone, calcitonin, 25-OH vitamin D(s), and tissue culture studies; and a number of clinical subjects and interests. Results of the workshop are being prepared for publication in book form in 1971.

The second September conference was the "Workshop on Bioengineering Problems of the Spine," sponsored by the Surgery A and B Study Sections, which took place September 12, 1970, in Bethesda with about 58 participants attending. The purpose of the workshop was a free and candid exchange of information and ideas between individuals in the field of engineering and medicine, who have proven interest in the application of bioengineering principles and techniques toward solving problems of the spine; to emphasize the necessity for close cooperation and understanding between representatives of these two disciplines for effective planning and pursuit of bioengineering approaches.

The program was divided into two parts. The first dealt with models of the spine, including discussions of the concept of such models and of kinematic, lumped parameter dynamic, and distributed parameter dynamic models. The second portion of the program was devoted to problems in scoliosis, particularly to defining the spinal curve in scoliosis and some theoretical approach to treatment. Practical application of bioengineering models in research related to tolerance of the spine to impact; i.e., as is developed in ejection from moving aircraft, is entirely feasible and quite useful at present. On the other hand, it appears that a substantial amount of work remains to be done before similar approaches to such complex problems as scoliosis may be successful. The engineers sought the guidance of the physicians in definition of the problems and identification of some of the anatomical and physiologic pitfalls that might prevent application of a mathematical or physical model. The overall effect seemed salutary, and it is likely that increased contact between the two groups will result from this interchange. A paper on the workshop will be published during 1971 in the Journal of Biomechanics.

In conjunction with the January round of study section meetings, several more conferences were held to examine research problem areas of special interest. A large conference, sponsored by the Surgery A and B Study Sections, was on "Boundary Effects of Moving Blood." This conference took place January 13-15 in San Diego, California. About 200 scientists from disciplines involved with the use of heart prosthetics assembled to discuss the response of the cellular and noncellular components of blood to the surfaces with which they come in contact.

This conference dealt broadly with the physical, chemical, and biological reactions that take place between moving blood constituents and the surfaces by which they are bounded, including the behavior of blood particles in flow and the effect of wall shear and turbulence on the cellular elements. There was specific discussion on the problems involving the gaseous interface, liquid surfaces (fluorocarbons, silicones, oil, etc.) surface chemical aspects of clotting, the phospholipid water interface and solid surfaces. Another session was devoted to applied technology as related to the dynamics of thrombus formation, to the classification and in vivo evaluation of antithrombogenic surfaces, and to covalently bonded proteins. The interchange of ideas and the wide publication of the proceedings are expected to stimulate further interdisciplinary communications and result in more fruitful research.

A report of a workshop on organ preservation, sponsored by the Surgery A and B Study Sections in April 1970 and referred to in last year's Annual Report, was published in the March 1971 issue of Surgery, Vol.69, No.3, pp. 321-325.

"Prolactin" was the subject of a workshop sponsored by the Endocrinology Study Section and the Reproductive Biology Study Section. On January 11-12 in Bethesda, the chemistry, physical properties, physiology, assays, and comparative data in higher vertebrates relating to prolactin and prolactin-like substances were discussed by 16 participants. Special attention was given to the possible existence of a human prolactin. Dr. C. H. Li revealed for the first time the almost complete amino acid sequence of human placental lactogen. Discussions of assay methods for measuring the pituitary lactogenic hormone emphasized the very sensitive techniques that would allow the determination of plasma levels of the human hormone. Detailed evidence for the existence of a distinct human prolactin was presented by several speakers.

A workshop on "High-LET Radiation in Radiotherapy," sponsored by the Radiation Study Section, met in Washington, D.C., on January 12-13, to investigate the status of research involving potential use of high-LET radiation in radiotherapy and the possible alternative physical ways of achieving results similar to those of high-LET particles. In addition to presenting the multidisciplinary background considerations involved in deciding whether high-LET radiation would be useful, publication of the workshop material should stimulate realistically posed research in this field.

About 35 participants heard experts review the status of the work on various aspects of the problem, indicate the bearing on prospects for radiation therapy, and outline what further research appears to be needed. Papers and discussion covered the biological aspects of the use of high-LET radiation, fast neutron radiation therapy, and other modalities--negative ion therapy, alternatives to high-LET radiation, and heavy ion therapy. A report will be published this year.

A report of a workshop sponsored by the Radiation Study Section, held in New York, January 13-14, 1970, resulted in a publication entitled, Improvements in the Radiological Image, which appeared in the November 1970 issue of Radiology, Vol. 97, No.2, pp. 442-447.

The report, Time and Dose Relationships in Radiation Biology as Applied to Radiotherapy, referred to in last year's Annual Report, was published in August 1970 by the Brookhaven National Laboratory (Publication No. BNL 50203 (C-57)).

In Seattle, on January 13, the workshop on "Mathematical Modeling and Computer Use" was held with members of the sponsoring Study Sections, Cardiovascular A and B, representatives of the National Heart and Lung Institute, and invited discussants in attendance. During the morning, the following presentations were made and discussed: (1) a general introduction to the variety and relationships of different models and an exposition of their usefulness as experimental and conceptual tools; (2) specific respiratory models; (3) an analog model of mixing in the pulmonary airways; (4) models of capillary exchange; and (5) models of cardiovascular regulation.

The afternoon session was less formal. It had as its primary objective an exposition of approaches to the evaluation of grant applications containing a modeling proposal. Specific examples of grants and of the analytical process required of the reviewer were cited and much of the program was devoted to open "round-table" discussion. No publication is planned.

A report on the workshop, "Comparative Gastroenterology," referred to in last year's Annual Report, was published in the American Journal of Digestive Diseases, XVI(b)368, Vol.16, April 1971.

The Nutrition Study Section's workshop on "Nutritional Anemias," met on January 20 in Bethesda. About 25 members and invited speakers attended the workshop, which was designed to assess the status of research on metabolic relationships between folic acid and vitamin B_{12}, on iron metabolism, and on tocopherol deficiency.

The ability of either vitamin B_{12} or folic acid to produce a reticulocyte response in pernicious anemia demonstrated the metabolic relationship between these two vitamins. The finding that B_{12} functioned as a coenzyme in the formation of methionine with 5-methyltetrahydrofolic acid ($5\text{-}CH_3\text{-}FH_4$) as the methyl donor demonstrated a common metabolic reaction. Further evidence for a biochemical interrelationship between these two vitamins was provided in studies on the excretion of formiminoglutamic acid (Figlu) in rats, chicks, and man.

If iron deficiency is defined as a suboptimal amount of body iron, then any measurement that reflects this decrease should be considered. These include measurements of iron stores, of iron supply for erythropoiesis, and of anemia resulting from iron deficiency. There is no convenient means of assessing iron stores. They may be examined semiquantitatively in the marrow aspirate, where the preparation is stained for iron and the amount of reticuloendothelial hemosiderin deposits are graded. Store depletion may also be reflected in changes in an increased plasma iron-binding capacity although this increase may be blocked by infection or hypoproteinemia. It is most conveniently reflected in changes in iron absorption, although this too is blocked by infection. Iron supply for erythropoiesis may be conveniently and accurately measured by plasma iron and iron-binding capacity, best expressed as the iron saturation of transferrin, by red cell protoporphyrin, and by red cell indices of low volume and decreased cell hemoglobin. All of these measurements are affected by an internal block in iron supply such as inflammation. Cell indices are the slowest to change in the presence of iron deficiency and the least specific, being affected by other disorders in hemoglobin synthesis. Anemia, used traditionally as the initial screen in nutritional surveys, has two objections; its lack of specificity even though most nutritional anemia is due to iron deficiency, and the wide overlap between normal and anemic subjects. However, the hemoglobin concentration does establish the severity of depletion, once iron deficiency has been demonstrated.

Evidence for tocopherol deficiency in nutritional anemia was reviewed in four areas: (1) experimental anemias related to deficiencies in animals due to oxidant hemolysis, to extravasation of blood into tissues, and to ineffective erythropoiesis, (2) reliability of criteria used to assess tocopherol deficiency in terms of serum tocopherol concentrations, susceptibility of erythrocytes to oxidant stress, urinary excretion of creatine, deposition of lipofuscin pigment in tissues, anatomical changes in skeletal muscle, and response to a therapeutic trial of tocopherol, (3) evidence that tocopherol deficiency can occur in man from controlled experimental studies in infants and in adults, as well as from studies of disease states in man including malabsorption syndromes, cystic fibrosis, abetalipoproteinemia, anemia of premature infants, and protein-calorie malnutrition, (4) therapeutic trials of tocopherol for anemia of premature infants with regard to characteristics of the anemia, natural history of the anemia without tocopherol therapy, design of the therapeutic trials, and significance of a decrease in reticulocyte count, as well as in anemia associated with protein-calorie malnutrition, and also in terms of response of the anemia to therapeutic agents other than tocopherol. The significance of reticulocytosis after tocopherol therapy may still be questioned in three ways: Is it fortuitous, a nonspecific response to tocopherol, or does it indicate a role of tocopherol in hematopoiesis in man?

On January 22, 1971, the Applied Physiology Study Section held a workshop, "Review of the Tecumseh Community Health Study and Other Aspects of Applied Physiology," at Ann Arbor, Michigan. After a description of the overall plans, progress, and potential of the Tecumseh Community Health Study, reports and data were presented on several research studies: the relationship of lung function tests and smoking habits with respiratory disease; a comparison of risk factors of people who subsequently died suddenly from coronary heart disease with those of age-matched individuals who were living and essentially healthy; exercise studies and findings; research on football head injuries.

The use of computers and various transducers in developing prostheses was demonstrated and discussed. Study section members visited the University Medical Center and several laboratories where research related to the interests of the study section was underway.

A workshop on the "Epidemiology of Venous Thrombosis" was sponsored by the Epidemiology and Disease Control Study Section, the Thrombosis Advisory Committee of the National Heart and Lung Institute, and the Council on Thrombosis of the American Heart Association. The conference took place in Bethesda on March 22-23. Except for a small number of distinguished guests, attendance was confined to the members of the sponsoring groups, about 40 in all. Three objectives were set for the meeting: (1) To attempt to identify those factors whose role in the causation of venous thrombosis is sufficiently well established for some kind of preventive action to be planned. (2) To list other possible causal factors, which seem to be of sufficient importance for epidemiological studies to be started, so that we may learn more of them. (3) To attempt to list those diagnostic criteria of venous thrombosis which will prove satisfactory for epidemiological investigations, biochemical, radiological, clinical or other types of investigations.

Presentation and discussion ranged over many topics: age and reproduction, endocrine, surgical, hematological and genetic, and other factors; cardiovascular disease; factors relating to gastrointestinal disease, infection, and dehydration; clinical criteria for epidemiological diagnosis, blood screening techniques; special diagnostic procedures; results of one epidemiological survey; synthesis of results and correlation with arterial thrombosis data; specific suggestions for future research. Publication of a conference report is planned.

A conference on "Sickle Cell Disease" was sponsored by the Hematology Study Section of DRG on April 5 and 6, 1971. For more than a year the Study Section had been planning this conference to stimulate research and improved patient care in sickle cell disease. A planning session to develop this conference was held in conjunction with the September 1970 meeting of the Study Section. Although the Study Section is primarily concerned with research, it was realized that the conference could not be limited to that aspect of sickle cell disease alone. Furthermore, as the conference proceeded, it became evident that in many areas patient care and research were necessarily related.

The conference did not limit itself to the current framework of finding mechanisms. In many areas it designed what were considered ideal approaches for providing improved delivery of patient care, better opportunities for clinical research, sources of stimulation for basic research and coordinated programs of education, screening and counseling. By setting these goals, it was hoped that all agencies involved could have a common purpose and plan so that individual programs could be designed to assist in the development of a long-range, overall program. It was realized that funding for different aspects of the overall program must of necessity come from varied sources, both nationally and locally. If, however, all funded programs could be coordinated as much as possible to complement each other, mutual assistance for individual aims could occur and unnecessary duplication of effort could be avoided. One example cited by the conference was the need for clinical research to be carried out in a setting where delivery of patient care was being done. Funding might come from two or more sources, but coordination would be essential to promote maximal development of both aims.

The conference was planned to include representatives of interested lay groups as well as physicians and scientists knowledgeable in various aspects of the disease. A report of this conference with its recommendations will be forwarded to the Director, NIH.

"Achievement in Minority Groups" was the subject of a workshop-conference sponsored by the Developmental Behavioral Sciences Study Section, National Institute of Child Health and Human Development, and the National Institute of Mental Health, April 20-21, in Chicago. Social scientists, including study section members, and laymen representing minority groups (about 30 participants altogether) met to consider problems of achievement in modern society and to examine ways in which minority group members perceive and seek various levels of achievement. The interaction of social scientist and layman is expected to lead to the emphasis of problems worthy of research.

On the first day participants were divided into six groups, each of which developed a report on an aspect of the conference subject. On the second day these reports were presented to the whole group and discussed. Conference results will be published.

The Tropical Medicine and Parasitology Study Section developed and attended a short workshop in Bethesda in connection with the April meeting of the study section. The workshop was entitled, "The Lower Trypanosomatidae as Analogue Models for the Pathogen Trypanosomes in Biochemical and Chemotherapeutic Research." Its purpose was to bring together expert representatives of different scientific disciplines and "schools of thought" on the problems and to come up with a clearer understanding of the value of lower trypanosomatid study systems and their potential for biomedical research. It is expected that a conference report will be published in an appropriate journal.

Members of the Allergy and Immunology Study Section conferred for a day after the close of their April study section meeting in Bethesda. The subject of the conference was, "The Status of Immunology." The purpose was to discuss the status of the various areas of immunology, determine what areas are being stressed today and those most likely to be emphasized in the future. Particular attention was given to areas not now given special emphasis in grant support programs, whether they should be, and what assistance the Study Section can provide concerning areas of special program emphasis.

A monograph of a conference sponsored by Pharmacology A and General Medicine B Study Sections in January 1970 on "Renal Pharmacology" is being published by Appleton Century Croft and will be available within fiscal year 1971.

The following conferences have been planned for fiscal year 1972 to take place in August and September 1971 in conjunction with fall study section meetings: (1) Biomedical Communications Study Section has scheduled a 2-day workshop to be held in Washington, D.C., in September; (2) Endocrinology Study Section plans a workshop on "Interaction of Steroid Hormones with Target Tissues," for August 27-28, in New York; (3) Toxicology Study Section will have a 2-day workshop in September in Bethesda directed toward developing a mechanism for introduction of toxicology into elementary, high school, and college teaching material; (4) Tropical Medicine and Parasitology Study Section is planning to hold a 1-day workshop on September 15 at the Rocky Mountain Laboratory, National Institute of Allergy and Infectious Diseases, in Hamilton, Montana, on "Dynamics of Infection of Arthropod Vectors, Higher Animal Hosts and Man with Microorganisms and Parasites."

STATISTICS AND ANALYSIS BRANCH

Major efforts were undertaken at the Branch level during the past fiscal year to bring the Bureau of Health Manpower Education (BHME) into the IMPAC system and to expand system services by making available to IMPAC users information on grant expenditures by budget category. These are discussed briefly in the next several paragraphs.

As a result of a joint study conducted in 1969 and the proposal to bring the BHME grant programs into the IMPAC system, negotiations were initiated and a final agreement was reached on March 4, 1971, between the Division of Research Grants and the Bureau of Health Manpower Education to enter all BHME programs other than the scholarship and loan and construction programs into the NIH IMPAC system on a current rather than a year-end basis, beginning with fiscal year 1972. A plan was developed for the inclusion of the fiscal year 1971 programs on a year-end basis. Beginning in fiscal year 1972, all BHME applications will be processed by DRG, including those competing applications to be reviewed by the June 1971 council, or other formal reviewing body, and noncompeting applications to be awarded in fiscal year 1972. The fiscal year 1971 data not currently maintained in the IMPAC Data System will be limited to awards only.

As an added service to IMPAC Data System users, a proposal has been advanced by the Branch to establish and maintain an auxiliary file or subsystem to the current IMPAC Data System for recording and analyzing grant expenditures by budget category. The principal uses of the file will be to provide a data base for NIH program managers from which accurate and up-to-date statistics on grant expenditures can be reported, and to answer special inquiries by the PHS, DHEW, OMB, and the Congress concerning these specific categories for which grant funds are being expended.

The file would be designed to accommodate information for all research and research training projects, and research career and fellowship awards for which a report of expenditure is required. A record would be created for each budget period in which an award has been issued. Each record would contain, as a maximum, 28 items of information, comprising 220 characters. The principal operating file would be maintained on magnetic tape and be capable of linkage to the IMPAC master files. On an ongoing basis, the file will contain up to 4 or 5 years of data, comprised of approximately 100,000 records. The operating file would be purged annually, transferring to a history file all records that were added 5 years prior to the purge date.

The major accomplishments and activities conducted by the Branch Sections are outlined below.

Data Processing Section. During fiscal year 1971, this Section was able to extend several new services to the IMPAC System users in spite of tight personnel and budget restrictions. These were made possible through system improvements, program modifications, and new data-capture procedures. Training efforts were expanded, with selective training being given to personnel in an effort to offset the loss of productivity normally associated with an understaffed operation.

A study to evaluate new and improved techniques and equipment for data capture, begun in fiscal year 1970, was completed. The study has led to the input of contract narratives into the system by use of a remote terminal and the development of a new system for capturing data on all new and competing applications through the use of an optical character reader, the IBM 1288.

The Section is continuing to participate in a study of the use of microfilm for computer output started in the past fiscal year. Several potential applications in which the present space-consuming hard-copy files can be replaced by a computer-generated microfilm file are under study in the Division of Research Grants. The microfilm file would be provided periodically and, consequently, would eliminate the need for the manual updating of the files. The proposal is expected to provide significant savings in man-hours. A preliminary test is being conducted for evaluation.

A major effort of the Systems Unit was devoted to the redesign of the data-capture procedures for new and competing applications utilizing an optical character reader. Forms were designed, equipment procured, personnel trained, and operational testing begun on those applications going to the November council. This system will cut the cost of processing the data by two-thirds for each application and is expected to provide additional savings by permitting interchangeability of personnel in peak periods. This should result in lower overtime and training costs, faster processing, and improved verification, thereby decreasing the number of errors and costly file updates. In addition to application processing, work is going forward to apply this method of data capture to several other areas, the most significant of which is the Project Address File (PAF). This is a file of approximately 37,000 records which contain the grantee and payee addresses and the vendor codes.

During the past year, the IMPAC Data System was modified and expanded to provide additional information on research contracts in several major areas. First, at the request of the Research Contracts Branch, OCG, the Systems Unit analyzed two procurement report forms, the Procurement Activities Report Form, HEW-522, and the Report on Procurement by Civilian Executive Agencies Form, SF-37, to determine what data must be added to the present Research Contract Record to permit the information required for the preparation of these reports to be computer generated. The analysis identified six new items for addition to each record. Necessary systems and procedures modification was completed, and the new data were added to the contract file during the fourth quarter.

The second area of major modification relating to contracts provided for the capture of 17 data items and two narratives from NIH Form 1688-1, Research Contracts Supplemental Information Record. The data items relate primarily to the project director and the senior scientists assigned to the contract. The narratives describe the objectives and the work scope of the contract and summarize the salient results to date. The data are currently being entered into the master file for each new and renewal contract.

The capture of narrative format texts presented a new challenge to the

Section. Traditional data-capture techniques did not afford an optimum means of capturing unstructured technical and scientific texts. The method of entering these data was an outgrowth of a system study conducted in the past fiscal year on the use of remote job entry to the system. Narrative input is by use of an IBM-2741 terminal, and the technique has proven satisfactory. The texts are entered as variable length records, converted to fixed length, and stored on disk as an auxiliary file. A query to produce reports containing both item and text data for each research contract was included in the system design.

A project was undertaken to make available the narrative statement of project objectives as it appears on the Notice of Research Project (NRP). This is being accomplished through arrangements made between the Branch and the Science Information Exchange (SIE) for the mutual exchange of information for fiscal year 1971. Weekly, the Section provides SIE with computer tapes containing information on all research projects awarded during the preceding week. This information is entered directly into the SIE system, and SIE adds narrative statements as reported on the NRP concerning the objectives of the project to the files. Each quarter, SIE returns to NIH the recorded text for each project furnished.

A major modification to the scientific classification code structure of the IMPAC System was implemented this year. The purpose of the coding is to describe the scientific subject matter of extramural activities. The new code structure was designed and introduced by the Research Evaluation Branch, DRG. The scientific classification code scheme is composed of four Axes, as follows:

Axis I:	Discipline and Field, Primary Discipline and Field, Secondary Discipline and Field, Tertiary
Axis II:	Body System, Primary Body System, Secondary
Axis III:	Research Materials, Sources/Development, Primary Research Materials, Sources/Development, Secondary
Axis IV:	Drug Relatedness

Under the present system, research and research career grants are coded by the executive secretaries of the Research Grants Review Branch, DRG; research contracts, by the Research Analysis and Evaluation Branch, DRG. Codes are stored in the computer after preliminary validation. Validated codes are then verified by the assigning area and corrections are recorded on the file. Reports displaying codes or codes and translations and other administrative data are available upon request.

DPS participated in the DRG Continuation Application Distribution Control Study. This study has been established to determine the feasibility of institutional control over distribution of renewal and continuation research grant applications within the grantee institutional structure. Special computer processing routines have been developed which identify those institutions participating in this study. Whenever continuation applications are computer-prepared for these institutions, they are identified and listed separately from other applications. They are then forwarded to the Research Grants Review Branch for distribution to a central point within the grantee institutions.

During the past fiscal year, the Programming Unit continued its work on system maintenance and program improvement and, in addition, initiated a large number of major program conversions. Work was started on the conversion of 130 programs from COBOL F to USASI COBOL when this version was adopted as a Federal standard. In addition, 65 programs were rewritten from RPG to USASI COBOL when the Division of Computer Research and Technology (DCRT) withdrew support of RPG. All conversions are expected to be completed by December 31, 1971.

A Priority Score Review Committee was established by the Chief of the Research Grants Review Branch, DRG, to study the use of IRG priority scores, and make recommendations for a standard system. It had been determined that the institutes were taking quite different approaches in applying these scores, some accepting the raw priority scores, others a decile ranking of priorities, and still others using more complex systems of standardizing and/or normalizing the reported priority scores. The Committee recommended that DRG report two scores for each research grant application recommended for approval, one, the raw priority score, and the other, a normalized priority score, and that funding institutes be given the option of using either of these in making awards. In carrying out the Committee's recommendation, the Programming Unit wrote a series of programs to compute and record the normalized score in the IMPAC master files, thereby providing the capability of adding the normalized score to the IRG summary statements, resumes, and council worksheets, in addition to the raw score.

In December of 1970, DCRT made available to DRG, for the first time, Class A and Class B initiators for submission of additional computer jobs. Originally, DRG was limited to one Class D initiator. The new initiators allow the accomplishment of program testing, short queries, and small jobs with a significant decrease in the elapsed time for completion.

Research Documentation Section. Procedures for a comprehensive RGI computer system were completed and put into operation this year for computer storage and automatic search and retrieval of scientific information about research projects currently supported by the Public Health Service. This independent retrieval system, on disk storage, is composed of four files programmed to interact in such a way as to form a fully reconcilable data base and indexed for simplified file linkage. One of the files represents the scientific term authority list which is used to index documents associated with PHS research grants and contracts. A second file stores the indexed input in term-grant number sequence, while a third file stores the same data in reverse grant-term number arrangement. The fourth file, which contains grant number and other identification items, such as name, address, title, fiscal information, and NIH central scientific classification codes, is extracted from the NIH IMPAC System on a regularly scheduled update basis.

The query capability of the RGI computer system is programmed to supply information ranging from a straightforward listing of grants pertaining to a single scientific subject term to a compendium of projects relating to any number of subject terms, with an upper limit of 500, using combinations of "and," "or," or "not" search logic. Answers to searches can be furnished in a variety of formats incorporating whatever fiscal, grant identification, or subject matter items the user requests. The computer response time is from 1 to 2 days, although the elapsed time varies in accordance with the complexity of the search and the amount of review required by professional staff of the Section. Since its recent inception, the system has been used frequently and successfully to furnish several NIH program administrators with large amounts of data for analyzing existing NIH programs and planning new approaches.

The scientific data used as input to the RGI computer system are the indexing items that are selected to prepare the annual editions of the Research Grants Index. Plans are being developed to utilize the RGI computer system for preparing magnetic tape for computer composition of future editions of the Index.

The tenth edition of the Research Grants Index (PHS Publication No.925, 2 vols., 1876 pp.) was published in April 1971. This edition describes the scientific aspects of over 17,000 biomedical grants and contracts supported by the various extramural research programs of the Public Health Service during fiscal year 1970. Copies of the Index are distributed annually to information personnel, scientists, and scientist-administrators within the Federal Government. Approximately 2,000 copies are distributed to libraries and to various administrators of research programs in domestic and foreign PHS grantee institutions. The Index is also on sale by the Superintendent of Documents, U.S. Government Printing Office, for $13 per 2-volume set.

This 1970 edition was produced by computer composition utilizing new temporary routines which were devised in the Section, with the assistance of personnel from the Data Processing Section of the Statistics and Analysis Branch. The method resulted in a publication date much earlier than the previous year.

In September 1970, the third edition of the Medical and Health Related Sciences Thesaurus (MHRS) (PHS Publication 1031, 496 pp.) was published. The Thesaurus is a computerized vocabulary maintained and updated in the Research Documentation Section for use as the indexing authority list for both the Research Grants Index and the RGI computer search-and-retrieval system. Continual efforts are made to update terminology. This year, revisions consisted primarily of regrouping to the behavioral sciences, microbiology, and organic chemistry areas. Further vocabulary improvements will be made next year. A new format for the MHRS publication also is planned.

The Thesaurus is distributed only on a request basis. Last year, over 400 copies were sent in response to requests from scientists in local and international libraries, academic institutions, and governmental organizations.

In addition to these services, the Section continued to furnish extractions of its total yearly indexing data to the National Institute of

Neurological Diseases and Stroke, as well as a tape copy of the files to a HSMHA component. It also continued its regular responsibility for indexing intramural projects. These projects are analyzed by the same method as that used for the extramural research grants programs. A separate search file is maintained for intramural projects, and an annual computer listing is made of the entire file in RGI format, but the data are not issued in book form.

Statistical Analysis and Surveys Section. The primary function of this Section is the collection, storage, computer retrieval, presentation, and analysis of data on the extramural programs of the NIH and PHS for use in policy consideration, program planning, program analysis, and program management. In addition, the Section is responsible for the coordination of responses to inquiries about the extramural programs received from the Executive and Legislative branches of Government and non-Government sources. The major activities and outputs of the Section during fiscal year 1971 are described in the following paragraphs.

NIH Research Grant Manpower Survey. A preliminary report on the major findings of this survey was issued in April 1971. It presented estimates of personnel expenditures and numbers supported by fiscal year 1969 research grants. Considerable detail was furnished on the distribution of students and postdoctorals, faculty, and other staff by such variables as: awarding institute, size of award, kind of institution, and major component. Additional key survey data, including information on field/discipline/specialty, were provided to the Associate Director for Program Planning and Evaluation for use in an analysis of NIH training programs requested by the Office of Management and Budget.

Statistical Items. One volume was published this year: No.12, Indirect Trainees Supported by NIH Research Training Programs, FY 1965-1968 Funds.

Public Health Service Grants and Awards. Three volumes of the annual multi-volume series on PHS grants and awards were issued: Part I, NIH Research Grants, FY 1970; Part III, HSMHA and CPEHS, FY 1969; and Part V, PHS Summary FY 1968.

Data for the pocket reference book, Basic Data Relating to the NIH - 1971, were compiled in cooperation with the NIH Office of Program Planning. This publication presents information on the programs and resources of the NIH.

Other publications by the Section included: The Research Career Program Annual Report for FY 1970, the Monthly News Release of Research Grant and Fellowship Awards, and Summaries of Initial Review Group Actions on Research Grant Applications (four issues).

Reporting Activities. There are several major reporting activities which are recurring or cyclical and consume a large portion of the man-hours available in this Section. The annual survey conducted by the National Science Foundation entitled, Federal Funds for Research, Development and Other Scientific Activities, is coordinated and prepared by this Section for the entire NIH. In general, the survey covers all the NIH research activities by performer, field of science, geographic area, basic and applied research, and combinations of the above. A segment of the report is also devoted to Scientific and Technical Information Activities.

Obligations for Medical and Health Related Research is an annual survey of all Government-sponsored medical research. The NIH response to this survey is also coordinated and prepared by this Section and requires data by performer, program, and State, in addition to some manpower statistics related to training grant and fellowship programs.

NIH Research Program Trends is a pamphlet consisting of several tables and charts which highlight various trends in the NIH research grant programs, including award rates, approval rates, application volume, and average grant size.

At the beginning of each review cycle for research and training grant applications, statistical reports are prepared which present data on the number and dollar value of applications received for review. The presentation is by institute and initial review group, and copies are distributed to each institute/division, the Office of Financial Management, and to each initial review group.

During each review cycle, statistical tables entitled, Summary of Initial Review Group Actions on Research and Training Grant Applications, are prepared on a current basis several times during the review cycle for use of the Office of Financial Management, the institutes/divisions, and the Career Development Review Branch, DRG.

Commitment Reports for Research, Training, and Research Career Program. These reports are prepared annually for the Office of Financial Management as part of data required as input to the development of the NIH budget. The IMPAC System is the authoritative source of information on funds committed for noncompeting grants and awards. These reports are also distributed to each institute/division for their use.

CASE Phase I and CASE Phase II are Government-wide reporting systems on support to institutions of higher education and other nonprofit organizations. CASE Phase I is an institution-by-institution report of all NIH extramural support by program for most nonprofit organizations with an individual report for each school of medicine. CASE Phase II is a project-by-project report of all support to institutions of higher education, and after the FY 1970 report will not be required.

The Section handles several hundred inquiries each year from sources at all levels within and outside of the Government for statistical and analytical information about the NIH grant and award programs and about the characteristics of PHS grantee institutions. The inquiries range in complexity, as measured by manpower consumption, from several hundred man-hours to less than 1 man-hour per project. Many of these requests are satisfied by shelf reports, but the IMPAC System remains the primary source of data to respond to most requests. Around 7,000 queries were processed through the Inquiry and

Reporting System for this purpose during fiscal year 1971.

The Section conducted a special 20-hour training course covering the IMPAC System and the Inquiry and Reporting System used to prepare queries for the selection and manipulation of data contained in IMPAC files. A total of 26 institute and division personnel completed the course.

Approximately 1,300 pieces of graphic art work were completed by the illustrator in fiscal year 1971. This work included: tables lined for printing, cover designs, certificates, charts, photographs, signs, visuals, special exhibits, and illustrations for flyers and handbooks.

RESEARCH ANALYSIS AND EVALUATION BRANCH

The Research Analysis and Evaluation Branch continued to perform the general activities carried out under its former designation, Office of Research Analysis and Evaluation, except that publication of the "Notice of NIH Conferences" was transferred to the Institutional Relations Office, DRG.

Requests were received for information on a wide variety of topics, in response to which the following reports were prepared:

NIH Support of Research on Freeze-dried Bone (for the Associate Director for Extramural Research and Training (ADERT));

NIH Support to Departments of Chemistry (for Federal Interagency Chemical Group);

NIH Support to Departments of Chemistry, Fiscal Year 1964-1970 (for National Academy of Sciences Committee on Chemistry);

NIH Support of the Chemical Synthesis of Synthetic Analgetics (for Library of Congress);

NIH Support of Sickle Cell Anemia (for ADERT);

NIH Support of Genetics Research (for DHEW Health Options Committee);

NIH Support of Genetics Research (for ADERT);

The American Type Tissue Culture Collection as an NIH Resource (for ADERT);

NIH Grant Expenditures for Major Instruments in Chemistry Departments (for National Science Foundation);

NIH Support to Departments of Surgery (for Surgery A and B Study Sections and the National Heart and Lung Institute);

NIH-Supported Research on Prostaglandins (for Office of Population, U.S. Agency for International Development); and

Investigators Actively Engaged in Pharmacokinetics Research -- Basic and Clinical (for Fogarty International Center).

The Branch is engaged in a study of NIH support of research dealing with diseases (or departure from optimal function) affecting children up to 5 years of age. A major amount of support is directed towards anoxic and hypoxic conditions, not elsewhere classified; behavioral disorders of childhood; congenital anomalies -- cleft palate; congenital anomalies of glands and organs; congenital anomalies of the heart; cystic fibrosis; diabetes mellitus; hemolytic diseases of newborn (not hereditary defect); hereditary hemolytic anemias -- glucose-6-phosphate dehydrogenase deficiency, and sickle cell anemia; hereditary neuromuscular disorders (includes progressive muscular dystrophy); leukemia; mental retardation; nephritis; phenylketonuria; poisons, burns, trauma, adverse medicinal effects; porphyrin metabolism; and respiratory distress syndrome.

A study dealing with criticisms of disapproved applications was undertaken because of continuing interest by administrators at academic and research institutions applying for NIH support. The survey revealed that disapproved applications receive much the same criticisms as when a similar study was made 10 years ago.

That the underpinning of applied research is basic research was illustrated by following a path from non-mission-oriented research projects to a clinical application. Of even greater interest was the observation that the development of a diagnostic clinical procedure could be traced through a continuum of NIH-supported basic research. Additional studies of this nature are in progress.

The project dealing with the impact factor, a statistic used to evaluate the significance of research contributions and scientists, continues. Various factors that might influence the impact factor such as age of an investigator, judgment by his peers, and the ratio of the total count of citations to the total count of published papers is being studied.

A revised 1971 edition of the NIH Central Scientific Classification Code (CSCS) was printed and distributed to all the components of NIH. This version of the CSCS incorporates suggestions from the institutes and from the executive secretaries of the Research Grants Review Branch. Some characteristics of the 1971 Central Scientific Classification Code are: (1) a listing of areas of biomedical research activity ranging from physics to biochemistry to training of health science professions to the development of new diagnostic procedures; (2) a listing of anatomical terms; (3) a listing of research materials used plus designations of clinical or non-clinical; (4) the stage of development of human or other forms of life used, as well as developmental aspects; and (5) an indication of whether a study is drug-related or not.

In general, the CSCS differs from most information retrieval systems because of its purpose, which is to provide an estimate of NIH support of broad areas of biomedical research. Consequently concepts, not details, are its primary characteristic. This imposes the restriction that useful information may be retrieved only by individuals with a scientific background.

A member of the RAEB staff served as Chairman of the NIH Child Day Care Center Committee from its inception in September 1970 until her retirement in May 1971.

INTERNAL OPERATIONS BRANCH

The Office Services Section of the Internal Operations Branch assembled and mailed an average of 7,604 grant and award application folders and 6,800 miscellaneous packages each month. The Section also continued to provide planning and assistance in accomplishing several major moves within the Division of Research Grants, involving all the major branches, and to maintain responsibility for the acquisition and maintenance of equipment, furniture and supplies, and printing services.

The Forms Management Office provided technical and coordinating services in the revision of four forms and processing of eight new forms. Ten forms were made obsolete. Nine extramural forms pertaining to the fellowships program were revised. The budget page of the new research grants application form has been revised and is now in committee. The remainder of the new and revised forms include the Report of Expenditures for Training Grants, Summary Report of Trainees, Equipment Accountability, Progress Report--Personnel Related to Project and Training Grant Continued Support (Instructions and Progress Report).

The Special Services Section accomplished approximately 1,200 separate typing jobs during the period under review. In addition 4,000 Flexowriter jobs consisting of programmed and unprogrammed letters (5 to 50 or more) were completed. Other fill-in type work included filing of IBM cards for the Statistics and Analysis Branch, and providing dictation and transcription services for components of the Office of the Director, DRG, and the teaching of a shorthand class. The services of this Section are also provided to NIH institutes and divisions, and the Office of the Surgeon General.

The Mail and Files Section daily received and processed for delivery a volume of incoming mail addressed to the Division. Over the past year there has been a 50 percent increase in the mail received. The Section also maintained audit files for the NIH institutes, other bureaus of the Public Health Service, and DRG. During fiscal year 1971 the audit file function of this Section was transferred to the Office of Financial Management and the remaining mail unit was reassigned to the Referral Office, DRG.

The Travel Section received and processed over 4,300 travel vouchers for DRG personnel and consultants serving on the review committees and study sections. The Section also offered assistance to Division travelers in plotting itineraries, preparing vouchers, and obtaining tickets and travel advances.

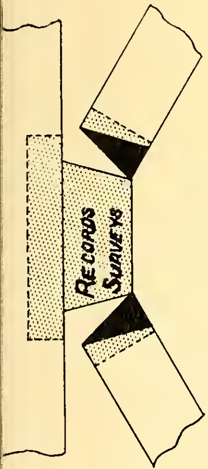
A member of the IOB staff is serving as DRG's representative on the Recreation and Welfare Association Council for the 1971-72 calendar year.

HOW TO USE
THESE SEPARATORS

Use one page for each separation.

Select appropriate tab, add further identification if desired, and cover it with scotch tape.

Cut off and discard all tabs except the one covered by tape.



DRS

TABBED SEPARATOR SHEET
Form HEW-69

DIVISION OF RESEARCH SERVICES

Report of Program Activities
July 1, 1970, through June 30, 1971

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NATIONAL INSTITUTES OF HEALTH

DIVISION OF RESEARCH SERVICES

Report of Program Activities
July 1, 1970, through June 30, 1971

A. Objectives

The Division of Research Services provides scientific, technical, and engineering services to support and further the research programs of the National Institutes of Health. All services are geared to the needs of Institute programs. Therefore the Division makes a continuous effort to keep informed of Institute plans. The DRS organization, staffing, and functions are adjusted accordingly to maintain an effective program of centralized services.

B. Current Programs

A broad range of central research support services and products are provided by the Division and its five branches: Biomedical Engineering and Instrumentation, Environmental Services, Laboratory Aids, Library, and Medical Arts and Photography. The current programs of the Division include the following:

1. Biomedical engineering of methods, systems, instruments, and materials
2. Instrument fabrication and maintenance
3. Development of an environment conducive to quality research and compatible to patients, staff, and community
4. Production of bacteriologic and tissue culture media
5. Preparation of sterile glassware
6. Production of genetically defined rodents and rabbits
7. Quarantine and conditioning of dogs, cats, and primates
8. Dog blood donor colony
9. Maintenance of farm animals
10. Animal surgery and recovery
11. Animal health services
12. Library and computerized bibliographic services
13. Foreign language translation
14. Still and motion picture photography
15. Graphic arts services and exhibits design
16. Medical illustration and model making

C. Program Progress and Accomplishments

1. Management Analysis Projects

The Data Reporting System (D*R*S) was developed, tested, and installed throughout most Sections in the Division. The system provides information to management to facilitate control of any recurrent quantifiable event. During the first months of its operation, the system was used primarily in the analysis of small animal production and issues. In addition to the analysis of many DRS services, the system is being applied to quantities as different as animal mortality data and Management Fund Obligations.

A major output of the D*R*S is the Trend Report. On one page of this report the most current 13 months of data for an item is displayed grahpically. The same page displays a rank-ordered usage distribution (such as usage by Institutes, expense categories, etc.). In addition, cumulative figures for the current fiscal year are compared to cumulatives for the preceding fiscal year. Much of the input to the system is obtained from data collected for billing purposes. Another widely used input mechanism is numeric hand printing on optically readable coding sheets.

The management analysis staff worked with the Branches on several other projects during the year. These included the financial conversion of the Photography Section to the NIH Service and Supply Fund, improvement of the Media Unit non-formula billing system, re-design of the Environmental Services Branch workload reporting system, and the experimental use of a computerized text-editor (WYLBUR) in the preparation of the Annual Report, speeches, letters, etc.

2. Equal Employment Opportunity

The DRS EEO Coordinator was appointed in July 1970, and the Director's Advisory Committee (DAC) on EEO was established in June 1970. They are assisting the Division and Branches in creating a better environment for understanding between white and black employees at all levels. This effort has precipitated several specific recommendations and results.

Higher level review and attention is being given to the selection of supervisors; and coordinated employee/supervisor reviews are being made of position descriptions for accuracy. To eliminate the impression of pre-selection or favoritism, the selecting official is no longer permitted to serve as a member of a Qualification Review Board. Greater use is being made of lower graded employees on QRBs. a policy to ensure a more systematic designation of essential employees has been developed; uniform Special Leave procedures have been issued; career counseling has been initiated; and more time and increased resources have been committed to developmental training.

Division recruiting practices continued to receive close examination and limited gains were made in hiring blacks and other minorities in higher than entry level positions throughout the organization. A major effort was made to better advertise job vacancies and training opportunities. In conjunction with this effort, the NIH Merit Promotion Plan was explained to all employees.

The Laboratory Aids Branch and the Library Branch continued their policies of rotating assignments to provide additional opportunities for intra-Branch development. As a result of the information and experience gained through such assignments, two technicians in the Library Branch successfully passed the Civil Service Commission test for Librarians and were able to move into the professional librarian series.

3. Employee Development

A total of nearly 17,000 manhours of training was recorded, indicating an increase of approximately 25 percent for the Division. Of this total, approximately 11,000 manhours were in courses offered by colleges/universities, private manufacturing firms, and other non-Government educational activities; 2900 in interagency courses conducted by CSC, GSA, or other Government agencies; and 2700 in in-service courses offered by DRS, NIH, or other DHEW activities. Increased attention to the training needs of lower-graded employees (GS-4 and below) resulted in an increase of approximately 35 percent in the number of manhours of training attended by this group.

Participation by DRS employees in the NIH Adult Education Program continued to increase during FY 1971. Currently, 27 are attending the Adult Basic Education Program and 22 are attending the High School Equivalency Program.

Through a contract with Montgomery County Public Schools, the course "Principles of Chemistry," was conducted for 18 DRS employees (majority were lower-graded) to assist them in better understanding the chemical processes involved in their work. Additional sessions of this and similiar courses will be conducted during FY 1972.

DRS participation in the New Careers Program included the following trainee positions filled during FY 1971: Administrative Intern (Trainee), GS-5; Medical Equipment Repairer Helper, WG-5; Biological Laboratory Technician (Trainee), GS-4; and Library Technician (Trainee), GS-5. Plans call for establishing at least five new trainee positions in FY 1972.

Numerous short courses were conducted by DRS branches for selected DRS and B/I/D employees. The Environmental Services Branch conducted eight courses on such environmental health subjects as laboratory safety, the use of herbicides and rodenticides, and sanitation techniques. LAB conducted a comprehensive course on laboratory animal care for approximately 30 NIH employees about one-half of whom were from LAB. As a result, the majority of the participants were certified as junior or senior animal technicians by the American Association for Laboratory Animal Science. Also BEIB conducted its popular course on the use of the ultracentrifuge for several B/I/D investigators.

4. Employee-Management Relations

Division and Branch management officials conducted negotiating sessions and reached agreements with AFGE officials on a two-year labor management contract between the AFGE union and the Medical Arts and Photography Branch.

At the request of DRS and NIH, the DHEW has asked the Department of Labor to make a ruling as to the appropriateness of the bargaining unit within the Library Branch at the time of the October 14, 1969, election. The election gave AFGE exclusive bargaining rights for all nonsupervisory personnel within the Branch. The question raised concerns whether professional librarians and technical information specialists were incorrectly included in the bargaining unit.

5. Environmental Services

Increased concern with environmental quality was reflected in the establishment of three NIH committees directly related to the Environmental Services Branch. These committees are: The Inter-Institute Committee on Biohazards; The Coordinating Safety Council; and the Ad Hoc Committee on Environmental Differential Pay. In addition, a report on environmental working conditions at NIH was prepared at the request of the NIH Director's Office.

Monitoring for mercury discharges into the sanitary sewer was instituted. Subsequent reductions in NIH use of mercury compounds and increased recycling of mercury have greatly reduced pollution levels in waste water.

The biohazard control program continues to gain. Additional assistance was given by the establishment of an NIH-wide policy on the use of horizontal and vertical laminar flow hoods. Substantial ESB staff time was given to consultation with individual laboratories on hazard identification and control and equipment procurement. Major projects included consultation on the construction of the biological control isolation suite in Building 36 and emergency decontamination of the Auburn Building following an outbreak of tuberculosis in a nonhuman primate colony.

Training programs for select NIH employee groups were increased in scope and number in an effort to institute improved procedures and practices. Ten new courses were developed.

6. Biomedical Engineering and Instrumentation

The professional staff of the Branch was involved in a variety of research and development projects. These included, surveys of surgical and patient care facilities leading to recommendations for minimizing electrical hazards, and more concentration on the analytic aspects of physiological systems related to pharmacokinetics in brain injury, hemodialysis, and cancer chemotherapy. The concepts of thermodynamics and chemical kinetics with computer simulation have broken through barriers to progress in antineoplastic drug therapy, hemodialysis, and an understanding of mechanisms related to brain edema.

A strong emphasis on economy during the first half of the fiscal year contributed to a reduction in the number of requests for design and fabrication of expensive new research instruments and, simultaneously, increased demands for maintenance and repair of existing apparatus. Reassignment of certain staff members and intensive training have enabled the Technical Services Section to prevent compromise of their responsivenss and individual productivity.

The first nine months of operation indicate that the Scientific Equipment Rental Program is self-supporting and, for the long run, will demonstrate its value as an economic means of providing useful apparatus.

7. Animal Programs

Although only a few months old, the Animal Disease Investigation Service (ADIS) has been well received by NIH investigators. It appears to be making significant contributions toward the improvement of animal health at NIH. A number of disease conditions were investigated and controlled, and detailed multi-disciplinary studies were often required. The information gathered will be useful to the biomedical research community in general, as well as to NIH.

Dedication ceremonies were held in May for the new Primate Building located at the National Institutes of Health Animal Center in Poolesville, Maryland. This facility is especially designed for quarantine, conditioning, and breeding of nonhuman primates. It has a maximum capacity of 1,500 animals. In conjunction with the dedication, a one-day symposium entitled, "Dealing with Tuberculosis in Primates," was held in Bethesda.

8. Library Services

A new Library Services Adviser program was implemented to broaden services offered by the Library in an integrated bibliographic and reference effort.

Several studies concerning additional automation of library operations and a study of the scope and coverage of the library collection are currently underway. Some significant organizational and personnel changes have been beneficial for library operations.

The case of Williams and Wilkins Company continues against the Government relating to the photocopy service and copyright law. The Chief, Library Branch, appeared as one of the witnesses for the Government at the trial held September 9-14, 1970.

9. Medical Arts and Photography

During FY 1971, the Medical Arts and Photography Branch streamlined work methods and instituted new and improved technology such as a computer graphics service capable of large scale production. Over $60,000 in contracted work was required to handle the increase in requests for color photographic and art services. Still photography services of MAPB were switched to the NIH Revolving Fund on April 1, 1971.

The _Artificial Placenta_, a scientific film produced by MAPB for NHLI won several awards in film competitions here and abroad. The awards included the CINE (Council on International Nontheatrical Events) Golden Eagle award, the Society of Federal Artists and Designers best of show award, and the bronze medal from the VI International Festival of Scientific and Technical Films ("Nikola Tesla" competition in Belgrade).

In March 1971, Mr. Arthur F. Moore was appointed Chief of the Medical Arts and Photography Branch. Mr. Moore was previously Chief of the Motion Picture Section, MAPB.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1970, through June 30, 1971

BIOMEDICAL ENGINEERING AND INSTRUMENTATION BRANCH Dr. Lester Goodman, Chief

I. SUMMARY

Attention has been devoted to programs which are important to the NIH mission but are not heavily demanding of capital expenditures. These include, for example, surveys of surgical and patient care facilities leading to recommendations for minimizing electrical hazards and more concentration on the analytic aspects of physiological systems related to pharmacokinetics in brain injury, hemodialysis, and cancer chemotherapy. The concepts of thermodynamics and chemical kinetics, with computer simulation, have broken through barriers to progress in antineoplastic drug therapy, hemodialysis, and an understanding of mechanisms related to brain edema. Through contract, a prototype catheter has been produced which monitors temperature, pressure, blood P_{O_2} and blood P_{CO_2}, with a single indwelling probe of approximately three millimeters diameter.

When additional resources become available, it will be possible to step up the pace of several promising lines of technical research and development; for example, automated clinical chemistry, microbial growth processes, laser technology, and biomaterials.

A strong emphasis on economy with the I/D's during the first six months of the FY contributed to a reduction in the number of requests for design and fabrication of expensive new research instrumentation and, simultaneously, increased demands for maintenance and repair of existing apparatus. Reassignment of certain staff members and intensive training has enabled the technical services sections to prevent compromise of their responsiveness and individual productivity. The Scientific Equipment Rental Program has been formally implemented. For the long term, it is anticiapted this program will demonstrate its value as an economic means of providing NIH intramural investigators with useful apparatus when needed.

Considerable attention has been given to Equal Employment Opportunity and the Affirmative Action Plan. A series of intrabranch meetings, involving every member, has achieved substantial progress in improving awareness and appreciation, by all concerned, of the issues and has markedly enhanced communications at all levels within the organization. Three new trainee programs have been proposed which offer distinct career potential for capable individuals who have been restricted to low-paying, low-skill jobs because of limited training. These are in the machinist, glassblower, and medical equipment repair categories.

Replacement of key figures at the Assistant Branch Chief and Section Chief levels, because of retirements, was accomplished with no undue disruption, since competent, experienced people were available to fill the vacated posts.

II. BRANCH PROGRAMS

A. Objectives

To provide direct and consultative engineering support to clinical and biomedical research projects, including advice on systems analysis, experimental design, and synthesis of technical expedients.

To design, develop, fabricate, and evaluate special-purpose devices and systems not commercially available.

To maintain and repair scientific laboratory and clinical equipment.

To obtain and disseminate information on developments and improved production methods in the biomedical engineering and instrumentation fields.

B. Current Programs

The primary purpose of the Branch is to provide service and support to the intramural program of the NIH. BEIB activities, therefore, are identified with many of the individual programs that constitute the intramural research effort. The overall Branch program is best described as the coordinated effort of its operating units.

1. Instrument Fabrication

Production, modification, and minor design of medical equipment and instrumentation systems requiring special tools and skills in the electronic, electrical, glass, mechanical, optical, rubber, plastics, welding, and sheet metal categories.

2. Systems Maintenance

Maintenance and repair of biomedical equipment and instrumentation systems and instruction of technicians and scientists in the proper use and operation of especially complex instruments and devices.

3. Supply

Acquisition and disposition of materials, parts, and equipment required for Branch operations and maintenance of controlled inventory stocks and records.

4. Engineering and Applied Science

Chemical, Electrical and Electronic, and Mechanical:

a. Direct and consultative professional services for fundamental and applied projects relevant to biomedical research and health care at the NIH.

b. Research, design, development, and evaluation related to new instrumentation and equipment.

c. Communication between NIH and the scientific community on engineering support to biomedical research and clinical practice.

5. Satellites

Satellites are technical support units, composed of selected engineers and technicians with appropriate shop facilities, located in certain areas where it is beneficial to make typical BEIB support and service immediately available via a controlled degree of decentralization. They are responsive to demands of local programs and operate as integral parts of the resident team but are administratively responsible to the central Branch. Each is especially tailored to meet specific needs of the host institute or Division. Satellite operation supplies the host with the advantages of a proprietary technical group and maintains the chief benefits of centralized resources.

C. Program Progress and Accomplishments

1. Technical Services

a. Instrument Fabrication Section

Temporary restrictions and uncertainties concerning I/D funding levels during much of FY 1971 were the apparent causes for a decline in the IFS workload. Several positions vacated by retirements and transfers were not filled, and a number of technicians were reassigned to groups within BEIB where demands were heavier. The Section completed approximately 3900 projects, compared with 4100 in the previous year, with dollar values of $682,000 and $647,000 respectively.

b. Systems Maintenance Section

During the year there was a significant increase in requests for maintenance and repair of scientific equipment. SMS performed approximately 9300 assignments, at a cost of $574,000, compared with 8400 jobs valued at $526,000 in FY 1970.

The DRS Scientific Equipment Rental Program was formally implemented under SMS management on September 1, 1970. Although operating on a modest scale, it has been well accepted by the NIH community. The equipment pool has grown to over 200 items and, as intended, the program has operated as a fiscally self-supporting activity with approximately $8,000 gross income having accrued from rental fees covering about 60 individual loans.

c. Supply Unit

Operational and administrative procedures have been improved in several ways to enhance economy and punctuality and reduce paper work. The unit processed approximately 13,200 transactions during the year and the dollar value of material handled increased from $348,000 in FY 1970 to $400,000 in FY 1971.

2. Engineering and Applied Sciences

a. Chemical Engineering

Close collaboration with intramural investigators has resulted in significant accomplishments derived from the application of chemical engineering to problems of experimental design and explication in biomedicine. These teams have been successful in demonstrating how mathematical analysis can lead to rational quantitative description and prediction of drug distribution in the body. In particular, the concepts of thermodynamics and chemical kinetics, together with computer simulation, have broken through long-standing barriers to progress in antineoplastic drug therapy, hemodialysis, and an understanding of mechanisms related to brain edema.

Techniques for testing, evaluating, modifying, and adapting polymeric materials for implants have been extended. Special attention has been given to segmented polyurethane, which is used with increasing frequency by investigators for a variety of projects in physiological research and clinical applications. An inter-agency agreement with the National Bureau of Standards has been continued to provided data on mechanical properties that the Branch is not equipped to obtain. Based upon BEIB innovations, a large manufacturing firm has independently conducted thorough toxicological evaluation programs related to biomedical applications of segmented polyurethane and is expected soon to offer devices on a commercial basis.

Three BEIB managed contracts for engineering development have been terminated. A contract with Scientific Research Instruments, Inc., on a "Multiple Parameter Intravascular Monitoring Catheter System" has produced a successful prototype catheter which monitors temperature, pressure, blood P_{O2} and blood P_{CO2} with a single indwelling probe of approximately three millimeters diameter. Further refinement is to be carried out by BEIB.

An operating pilot plant for conducting research on mechanisms and optimization in the large-scale production of specific microorganisms has been designed and constructed by contractors at the University of Pennsylvania, under project title, "Development and Evaluation of a General Purpose Prototype Microbial Culture System." It is anticipated that the system will be transferred to the NIH and utilized for continued collaborative research between BEIB and several institutes that have interest and need.

Oak Ridge National Laboratory has been collaborating with the Branch on "Concentration and Desalting of Protein Solutions." This project (Individual Project Report No. 5) has produced significant new knowledge related to the controlled purification and behavior of macromolecules of particular interest to the programs of several Institutes.

b. Electrical and Electronic Engineering

As implied elsewhere in the report, BEIB has completed a substantial number of new designs of electrical and electronic apparatus for the NIH research program.

Major developments were achieved in improving and extending techniques for utilizing fluoroscopic and X-ray data acquisition, processing, recording, and display in the context of cardiovascular research. These systems have been successfully used to obtain new information related to pressure-volume-flow relationships in the intact human and to examine the behavior and deterioration of prosthetic heart valve implants.

Collaboration with investigators from NIAMD and DCRT produced a valuable new tool for elucidating chemical structures of compounds containing carbon. The technique, based upon nuclear magnetic resonance, uses Fourier Transform principles to identify the presence and position of carbon-13 atoms in a complex molecule. This information, heretofore, was unobtainable because of the difficulties involved in detecting meaningful signals in the presence of strong background noise.

A new area of support was implemented via the Electrical Safety Program. This activity was conducted in collaboration with the Clinical Center Environmental Control Service group. It surveyed cardiac catheterization and intensive patient care facilities to assess electrical safety, detect potential hazards, and recommend modifications of equipment and practices to maximize safety of patients and investigators alike. Fundamental to the success of this project was the establishment of excellent working relationships with the Clinical Center staff. It is expected that the team will continue to work together, on a regular basis, to examine and improve the safety and effectiveness of all NIH patient areas.

In response to a number of requests from NIH investigators for guidance and apparatus for utilization of laser energy in research and therapy, a unique general purpose laser laboratory was constructed and equipped in Building 13. It has already been used for a variety of exploratory and developmental applications.

c. Mechanical Engineering

Continued emphasis on close collaboration with research and service staff throughout the NIH resulted in several substantial developments over the year.

Mechanization and automation of routine procedures received considerable attention. Efficiency and effectiveness of glassware handling was substantially enhanced with improved pipette plugging and pipette wrapping machines with capacities of several thousands of units per day. A new agar flask plugger and an automatic petri dish pouring machine were completed. These devices are expected to relieve the staff from time-consuming, routine manual tasks and increase the timeliness of delivery.

The family of automatic devices to improve clinical chemistry analysis has been expanded with new dispensing systems for volumes in the sub-microliter range. One especially interesting apparatus uses fluidic logic control to innoculate a 96-cup titration plate completely by mechanical means.

BEIB engineers have contributed to fundamental research design, as well as equipment development, in a number of significant problem areas. These include, for example, muscle rheology, host-parasite interactions, and the effect of carcinogenic agents in respiratory gases.

A major long-term project was initiated which concerns the optimum design of neurosurgical operating equipment and facilities. The ultimate results of this effort, in collaboration with surgeons, nurses, and technicians are expected to have significant influence on operating room design and procedures in the future.

3. Technical Advances

BEIB has delivered a considerable number of special purpose devices and systems in support of research programs. Items of more than casual interest follow:

A HYDRAULIC POWERED OPERATING TABLE facilitates manipulation of calf and sheep size animals for surgical procedures.

A NEW VIDEO DETECTION TECHNIQUE enables observation and measurement of dynamic cell and microorganism phenomena via light microscopy and closed-circuit-television.

An IMPROVED X-RAY FLUOROSCOPIC SYSTEM enhances _in vivo_ on-line studies of heart volume and arterial blood flow rates in the human.

An ULTRASONIC MICROMETER uses implanted crystals to monitor internal geometry of a pulsating left ventricle.

An ELECTROOPTICAL APPARATUS helps elucidate muscle structure by displaying diffraction pattern shifts of laser light transmission through a single contracting fiber.

An ELECTROMECHANICAL FEEDBACK APPARATUS facilitates muscle rheological studies of dynamic isometric and isotonic phenomena in the one millisecond time range.

A FLUID LOGIC CONTROLLED REAGENT DISPENSER automatically innoculates each cup of a 96-cell titration plate with precise volumes of fluid in the microliter range.

A NEW PIPETTE PLUGGER installs fresh cotton wads into pipettes at a rate greater than 100 per minute.

A PSYCHOPHYSIOLOGICAL TESTING APPARATUS provides for remotely programmable antagonist force sequences and automatic monitoring of protagonist force and displacement responses.

A MECHANIZED AGAR PLATE POURING MACHINE, with a capacity of 2500 plates per day, provides relief from an onerous routine manual task for several people.

An ELECTRONIC PSYCHOLOGICAL TESTING SYSTEM uses digital techniques to display test stimuli and record results in order to help evaluate the short-term memory capabilities of neurologically disturbed subjects.

A SCINTILLATING REACTION CHAMBER provides for quantitative measurement of gases evolved from metabolizing cells with unprecedented sensitivity and precision.

A NEW BLOOD TRANSFER DEVICE minimizes autologous blood loss during surgery, by providing for safe recirculation, and enables more effective extracorporeal blood conditioning.

A CEREBRAL SURFACE LAVAGE DEVICE enhances subdural distribution of therapeutic fluids.

An ACTIVITY MONITOR uses television techniques to acquire and display quantitative information related to movement of caged animals.

A VIBRATING REED ELASTIC MODULUS TESTING APPARATUS enables rapid evaluation of elastomeric physical properties.

A UNIQUE CELL CULTURE CHAMBER permits direct observation of parasitic attack on living cells under oil immersion light microscopy.

A COMPUTER-CONTROLLED RADIATION DETECTING SYSTEM is used for mapping intensity distribution in a 50 cm x 50 cm planar field.

4. Training

An effective professional and technical training program helps to maintain up-to-date support to NIH in engineering, fabrication, and maintenance. Fifty-four employees participated in academic and technical courses. Fifty-one (307 man days) attended formal education and training courses. Eight (52 man days) received specialized training on scientific equipment at suppliers' plants and at the NIH. In addition, three employees attend Basic Schools.

Under terms of Contract #NIH 70-370, BEIB/SMS and Beckman Instrument Company jointly conducted a two-week course in the operation of the Beckman Model 120 Amino Acid Analyzer attended by 20 scientists and technicians from NIH and other agencies. Dr. Erhard Gross, NICHD, lectured on theory; Beckman representatives provided instruction on practical operation.

The Systems Maintenance Section in cooperation with the Beckman Instrument Company, Spinco Division, sponsored a short course on the Model E Analytical Ultracentrifuge, covering basic operational techniques, relevant calculations and interpretation of results. The two-week course featured Dr. Marc Lewis, NEI, and Dr. Samuel Luborsky, NCI, as lecturers. The total attendance was 28.

A Medical Equipment Repairer Helper, WG-5, was hired to fill a position allocated to help implement the NIH Affirmative In-Service Development Program. He is presently on a one-year tour of duty at the U.S. Army Medical Optical and Maintenance School located at Denver, Colorado. Similar career preparation programs for the machinist and glassblower trades, stressing in-house training and academic instruction, have been planned. Implementation is expected at the beginning of the coming fiscal year.

D. Program Plans

Fiscal and personnel limitiations over the year retarded progress in program plans made earlier. Remaining issues for continued effort and potential achievement include:

1. Development of a comprehensive biomaterials research, development, and evaluation program.

2. Further exploitation of collaborative engineering research and development projects involving other institutes and divisions, together with private sector contract work.

3. Establishment of a cooperative fellowship or professional associate program in biomedical engineering with universities.

Plans for a space expansion in Building 13 call for occupancy during FY 1972. These additional facilities will help to extend and improve the Scientific Equipment Rental Program and contribute to the efficiency and effectiveness of BEIB service and support to the NIH.

An excellent beginning has been accomplished in the area of patient safety for the NIH clinical areas. This activity, in cooperation with the Clinical Center, is expected to receive considerable emphasis with concomitant benefits for NIH and the general community in the near future.

E. Publications and Patents

1. Publications

Bischoff, K.B. and Dedrick, R.L.: Generalized solution to linear, two-compartment, open model for drug distribution. *J. theor. Biol.*, 29: 63-83, 1970.

______, ______, Slater, S.M., and Zaharko, D.S.: A model to represent bile transport of drugs. In *Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology* 1970. Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p.89.

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Boretos, J.W.: Biomedical materials compatibility and the design challenge. *Paper 71-DE-8*, American Society of Mechanical Engineers Design Engineering Conference and Show, New York, N.Y., Apr. 19-22, 1971. ASME Headquarters, 345 East 47th Street, New York, N.Y. 10017.

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Fergusson, G.J., Petroff, C.P., Johnston, W.H., Zapata, A., Kleiman, B.S., and Gabelnick, H.L.: Multi-parameter intravascular catheter. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p. 83.

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2. Patent

J.I. Peterson and D.S. Young: Urine Preservation Package. U.S. Patent No. 3,534,851, October 1970.

III. INDIVIDUAL PROJECT REPORTS

Serial No. DRS-BEIB-1
1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Mathematical Analysis of Pharmacokinetics - Cancer Chemotherapy

Previous Serial Number: DRS-BEIB-1 (1970)

Principal Investigators: Kenneth B. Bischoff, Robert L. Dedrick, Daniel S. Zaharko

Other Investigators: Vincent T. Oliverio, Donald Forrester, James Longstreth, D. H. W. Ho

Cooperating Units: LCHPH-NCI
M.D. Anderson Hospital and Tumor Institute
Houston, Texas

Man Years:

Total:	2.2
Professional:	1.7
Other:	0.5

Project Description:

Objectives: To develop mathematical models for the distribution of antineoplastic drugs to:

(1) Account for interspecies differences in drug distribution kinetics.

(2) Examine physical bases for extrapolation of toxicity data from animals to man.

(3) Predict drug concentration history at any relevant site as a function of dose schedule and route of administration to provide a rational basis for optimization of therapy.

Methods Employed: Mathematical models are developed which make maximum use of physicochemical, physiological, and anatomical information. Appropriate differential equation sets are solved analytically or numerically, and results compared with experimental data. Areas of insufficient information are clarified, by additional experiments, to improve model effectiveness.

Major Findings: Methotrexate disposition has been studied in several mammalian species. After i.v. administration, drugs are excreted in the urine and bile, followed by partial reabsorption in the intestines. Mathematical models have been developed which describe drug concentration as a function of time in plasma and several tissues. In vitro - in vivo correlation of drug metabolism has been attempted with Ara-C and ethanol. This has led to an enhanced understanding of the role of physiological function in affecting and sometimes limiting rates of chemical reaction in the body.

Significance to Biomedical Research and the Program of the Institute: A major obstacle to progress in cancer chemotherapy is the lack of explanation for interspecies differences that occur in toxicity. At present, it is not generally possible to predict reliably the effect on man from results obtained with lower animals. The ability to predict the drug concentration-time behavior at any relevant site as a function of dose schedule and route of administration would provide a more rational framework for accounting for interspecies differences and for therapeutic optimization.

A key unresolved issue in toxicology, in drug development, and screening of potentially therapeutic chemical is the extrapolation of toxicity data from animals to man.

Proposed Course of Project: Mathematical modeling of the detailed distribution of drugs will be continued to provide a better scientific base for understanding species differences and optimization of therapy. The relationship between pharmacokinetics and cell death in vivo will be explored further. Correlation of in vitro - in vivo metabolism will be pursued.

Honors and Awards: The Washington Academy of Sciences Award in Engineering Sciences was presented to Dr. Robert L. Dedrick partly for this work.

Publications: Bischoff, K.B. and Dedrick, R.L.: Generalized solution to linear, two-compartment, open model for drug distribution. J. theor. Biol., 29: 63-83, 1970.

______, ______, Slater, S.M., and Zaharko, D.S.: A model to represent bile transport of drugs. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p. 89.

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Dedrick, R.L.: Letter to the Editor (Re extrapolation of toxicity of environmental contaminants from mice to men). Chemical Engineering News (In press).

______, Bischoff, K.B., and Zaharko, D.S.: Interspecies correlation of plasma concentration history of methotrexate (NSC-740). Cancer Chemotherapy Reports Part 1, 54: 95-101, 1970.

Zaharko, D.S., Dedrick, R.L., Bischoff, K.B., Longstreth, J.A., and Oliverio, V.T.: Methotrexate tissue distribution: Prediction by a mathematical model. J. Nat. Cancer Inst. 46: 775-784, 1971.

Serial No. DRS-BEIB-2
1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Pharmacokinetics of Environmental Contaminants

Previous Serial Number: None.

Principal Investigators: Henry L. Gabelnick, Anthony Guarino

Other Investigator: Robert L. Dedrick

Cooperating Unit: LCHPH-NCI

Man Years:

Total:	0.5
Professional:	0.5
Other:	.0

Project Description:

Objective: To describe the kinetics of distribution of environmental contaminants in animals and humans.

Methods Employed: Mathematical models will be used to describe and predict the concentration vs. time profiles of the contaminants in body tissues. Physiological and biochemical parameters will be measured experimentally when not available in the literature.

Major Findings: Project was initiated recently. A preliminary model for methyl mercury has been established but more experimental data are needed.

Significance to Biomedical Research and the Program of the Institute: We are becoming increasingly aware of the hazards caused by potentially toxic, mutagenic, and/or carcinogenic materials in our environment. The ability to quantify the expected concentrations of such materials on the basis of a likely exposure would be helpful in evaluating their potential hazard.

Proposed Course of Project: To obtain the necessary parameters and build sufficiently sophisticated models to describe the kinetics of materials such as methyl mercury and DDT.

Honors and Awards: None.

Publications: None.

Serial No. DRS-BEIB-3
1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Segmented Polyurethane

Previous Serial Number: DRS-BEIB-3 (1970)

Principal Investigators: John W. Boretos, Henry L. Gabelnick

Other Investigators: Don E. Detmer, Andrew G. Morrow, William C. Roberts

Cooperating Units: C and SURG-NHLI; National Bureau of Standards

Man Years:

Total:	1.5
Professional:	1.2
Other:	0.3

Project Description:

Objectives: To expand knowledge of segmented polyurethane, evaluate its chemical and physico-mechanical properties and exploit its potential as a material for biomedical applications.

Methods Employed:

(1) Long-term implants - chemical and physical effects.

(2) Development of new fabrication techniques for special purpose cannulas and other devices.

(3) Characterize permeabilities, moduli, and solution viscosities.

Major Findings:

(1) Subcutaneous implants in dogs show no major changes in tensile properties after three years.

(2) Pathology studies performed on tissue surrounding segmented polyurethane specimens implanted for three years in dogs showed no foreign body reaction or tumorigenesis. Particulate material seen in the zone adjacent to the implant was ascribed to particles of pigment; however, no foreign body giant cell reaction was observed.

A fortuitous partial extrusion of one ring through the skin, which may have resulted from post-operative abscess formation, showed good healing with minimal scarring and absence of neoplasia. This observation suggests the potential usefulness of the material for chronic percutaneous leads.

(3) Fabrication techniques were developed which make possible the "wet extrusion" of thin-walled capillaries of segmented polyurethane for possible use in a capillary oxygenator.

(4) Equipment was developed to characterize permeabilities and elastic moduli.

(5) Informal collaboration with the E. I. du Pont de Nemours and Co., Inc. and the Ethicon Corp. has resulted in the availability of segmented polyurethane to the medical world. In addition to the polymer, Ethicon is now offering a line of catheters, blood tubing, and custom devices for sale on a commercial basis.

Significance to Biomedical Research and the Program of the Institute: Physiologically compatible, stable elastomers with high strength properties are needed for a variety of biomedical research and clinical applications.

Proposed Course of Project: Implant analyses will continue through a five-year period. Evaluation of the potential of this material for blood oxygenators will continue.

Honors and Awards: None.

Publications:

Boretos, J.W. and Detmer, D.E.: In vivo stability of segmented polyurethane. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p. 148.

______, ______, and Donachy, J.H.: Segmented polyurethane: A polyether polymer II. Two years experience. J. Biomed. Mater. Res. (In press).

______ and Wagner, F.R.: Particle fragmentation generated in pump sets. J. Biomed. Mater. Res. (In press).

Serial No. DRS-BEIB-4
1. Biomedical Engineering and
Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Invidividual Project Report
July 1, 1970, through June 30, 1971

Project Title: Head Injury Investigation: Calvarium

Previous Serial Number: DRS-BEIB-4 (1970)

Principal Investigators: Ayub K. Ommaya, John W. Boretos

Other Investigators: Robert S. Bourke, Kenneth M. Nelson, Ronald A. Naumann

Cooperating Unit: SNB-NINDS

Man Years:

Total:	1.0
Professional:	0.8
Other:	0.2

Project Description:

Objectives:

(1) To develop a transparent calvarium suitable for chronic visual observations of the brain under conditions of trauma.

(2) To afford a means of studying brain edema following surgery or injury.

Methods Employed:

(1) Various devices for impacting the brain are directly attached to the calvarium. The degree of penetration into the brain can be controlled and observed.

(2) Perfusion of the cerebrospinal fluid is effected, using appropriate fittings attached to the calvarium.

Major Findings: Special preparation of the bone and dura mater, in conjunction with the dome, can isolate the space over each cerebral hemisphere of the intact primate. Unilateral edema may be induced and reduced by manipulating the potassium and chloride ion concentration of the perfusate.

Significance to Biomedical Research and the Program of the Institute: A method of studying the courses and effects of brain edema, *in vivo*, has been devised. More effective treatment of cerebral edema will develop from a better understanding of controlling factors.

Proposed Course of Project: Continuation and refinement of experiments, using the calvarium, to establish the existence of messenger pathways within the cerebral spinal fluid and explore modes of brain injury resulting from whiplash.

Honors and Awards: None.

Publication:

Boretos, J.W., Bourke, R.S., Nelson, K.M., Naumann, R.A., and Ommaya, A.K.: Isolated subdural space in the intact primate. *J. Neurosurgery* (In press).

Serial No. DRS-BEIB-5
1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Concentration and Desalting of Protein Solutions (Inter-agency Agreement with Oak Ridge National Laboratory)

Previous Serial Number: DRS-BEIB-5 (1970)

Principal Investigator: Charles W. Hancher (ORNL)

Other Investigators: Robert L. Dedrick (Project Officer), Herbert A. Sober

Cooperating Units: LNE-NIAMD; ORNL

Man Years:

Total:	0.9
Professional:	0.3
Other:	0.6

Project Description:

Objectives: To review and evaluate existing methods and equipment for concentration and/or desalting of enzyme solutions and to develop improved procedures and equipment.

Methods Employed: Commercially available membranes have been evaluated with capillary, thin film, stirred cell, and tubular flow configuration. Parameters examined include water flux, membrane retention of macromolecules, aging or plugging phenomena, effect of microsolute environment on membrane characteristics, and enzyme denaturation. Mixing in a thin film configuration has been studied with a solute pulse.

Major Findings: Filtration rate of pure water is generally proportional to the transmembrane pressure difference over the range studied; however, agreement with manufacturer's specifications is not always close. Initially high rates of ultrafiltration decrease with use for some membranes. With suitable membranes, retention of t-RNAs, alpha-chymotrypsin and bovine serum albumin has been excellent. A final report is in preparation.

Significance to Biomedical Research and the Program of the Institute: Large quantities of biological macromolecules are required to implement a variety of biomedical research programs. The production and purification of these materials in an effective and economical way are of great importance.

A problem common to many protein recovery flow sheets is the selection of methods and equipment to concentrate and/or desalt dilute protein solutions before further processing, storage, or use.

Proposed Course of Project: The contract is being terminated at the end of the fiscal year. The contractor will be encouraged to publish signficant findings in the open literature.

Honors and Awards: None.

Publications: None.

Serial No. DRS-BEIB-6
1. Biomedical Engineering and
   Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Investigation of Microbial Growth Dynamics

Previous Serial Number: DRS-BEIB-6 (1970)

Principal Investigator: Andre F. LeRoy, Stanley A. Robrish

Other Investigator: Micah Krichevsky

Cooperating Unit: EMS-NIDR

Man Years:

Total:	1.4
Professional:	1.4
Other:	.0

Project Description:

Objectives: To investigate methods for continuous monitoring and analysis of growth of microbial strains associated with dental caries.

Methods Employed:

(1) This work originally employed a fragile prototype fiber optic immersion probe with small aperture. Recently a more robust probe with a larger aperture has been subjected to preliminary tests; it shows promise for continuous turbidimetric measurement of microbial concentration.

(2) Work has been undertaken on measuring of diverse functions (pH, temperature, red-ox potential) of growing bacterial cultures by devices compatible with the Honeywell 516 process control computer in NIDR.

(3) An analysis of microbial nutritional requirements has been undertaken to allow systematic analysis of experimental data and generation of subsequent experimental strategy.

Major Findings:

(1) Continuous turbidimetry via fiber optic probe affords detailed data on a growing culture.

(2) Significant progress must be made in interfacing measuring and control devices with the real time computer if this system is to be practical.

(3) Definitive microbial nutrition studies will require extensive, sophisticated statistical analysis of the experimental data and considerable detailed understanding of the fundamental biochemical processes occurring.

Significance to Biomedical Research and the Program of the Institute: Continuous monitoring of the culture affords extensive data on growth as well as detailed information on transient changes that may occur during growth . As more and better data on diverse functions become available, better means of investigating the detailed physiological processes should result.

Proposed Course of Project:

(1) Continue study of growth characteristics of microorganisms in continuous and batch culture.

(2) Continue study of continuously monitored parameters and their relation to the physiological processes in growth.

(3) Continue analysis and systematization of the microbial nutrition problem.

Honors and Awards: None.

Publications:

LeRoy, A.F., Robrish, S.A., Wilson, J.J., Krichevsky, M., and Chassy, B.M.: Fiber Optic probe for continuous monitoring of microbial growth. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology, G.G. Vurek, Chairman, p. 339.

Robrish, S.A., LeRoy, A.F., Chassy, B.M., Wilson, J.J., and Krichevsky, M.: Use of a fiber optic probe for spectral measurements and the continuous recording of the turbidity of growing microbial cultures. Applied Microbiology. 21: 278-287, 1971.

Serial No. DRS-BEIB-7
1. Biomedical Engineering and
   Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Development and Evaluation of a General Purpose Prototype Microbial Culture System (Contract NIH 69-2258)

Previous Serial Number: DRS-BEIB-7 (1970)

Principal Investigators: A.E. Humphrey (U. of Pa.) (Jan. '71 to June '71)
D. Harrison (U. of Pa.) (to Oct. '70)
S. Nagai (U. of Pa.) (to Oct. '70)

Other Investigators: Andre F. LeRoy (Project Officer); Herbert A. Sober, Robert L. Dedrick

Cooperating Unit: LNE-NIAMD

Man Years:

Total:	1.1
Professional:	1.1
Other:	.0

Project Description:

Objectives: To develop and evaluate a general purpose prototype microbial culture system with various levels of environmental control.

Methods Employed: Application of industrial chemical process plant analysis and design techniques, together with modern feedback control methods, to the microbiological context.

Major Findings: Details of design and construction of a fermentation vessel and associated instrumentation were specified, and the system was built. Fabrication was completed in June 1970. Some evaluation tests were made with the system; these suggested modifications and improvements some of which have been completed.

Significance to Biomedical Research and the Program of the Institute: Closely monitored and controlled environmental factors in microbial growth culture are expected to yield important data for optimization of production of cells with desired characteristics.

Proposed Course of Project: Unforeseen delays made completion of the work within the original contract period impossible. A one-year extension was granted to afford time for meeting the evaluation called for in the terms of the contract. The system could realize its potential as a research tool at NIH if it became part of a program with clear, specific objectives and a commitment of supporting personnel and adequate funding.

Honors and Awards: None.

Publications: None.

Serial No. DRS-BEIB-8
1. Biomedical Engineering and
   Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Urease Kinetics

Previous Serial Number: DRS-BEIB-8 (1970)

Principal Investigator: James A. Longstreth

Other Investigators: Henry L. Gabelnick, Robert L. Dedrick, Herbert A. Sober

Cooperating Unit: LNE-NIAMD

Man Years:

Total:	0.8
Professional:	0.8
Other:	.0

Project Description:

Objectives: To establish the kinetics of homogeneous solution hydrolysis of urea by urease as a first step to characterizing insolubilized urease.

Methods Employed: Use of monovalent cation electrode to follow hydrolysis of urea as a function of time. The pH was also continuously monitored and maintained constant. Real time computer calculations using PDP-10 allowed low substrate concentrations to be maintained constant so that hydrolysis rate could be monitored as a function of time over a wide range of substrate concentrations.

Major Findings: Continuous monitoring of hydrolysis reaction demonstrated time dependence of urease kinetics which was not a result of either product, pH, or substrate inhibition. Results best explained by a second order autopoisoning phenomenon.

Significance to Biomedical Research and the Program of the Institute: Knowledge of the kinetics of urease is important in preparing an optimal form of insoluble urease. Such a material has been proposed for use in removal of urea from chromatographically separated nucleotide solutions and from uremia patients by means of hemodialysis or *per os*.

Proposed Course of Project: Homogeneous kinetics is near completion and principal investigator is leaving government service.

Honors and Awards: None.

Publications: None.

Serial No. DRS-BEIB-9
1. Biomedical Engineering and
   Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Multiple Parameter Intravascular Catheter Monitoring System
(Contract with Scientific Research Instruments Corp.)

Previous Serial Number: DRS-BEIB-9 (1970)

Principal Investigator: Gordon Fergusson (Scientific Research Instruments Corp.)

Other Investigator: Henry L. Gabelnick (Project Officer)

Cooperating Unit: None.

Man Years:

Total:	0.3
Professional:	0.2
Other:	0.1

Project Description:

Objectives: To develop a better capability for continuously evaluating the physiological status of a patient by simultaneously monitoring P_{O_2}, P_{CO_2}, blood pressure, and temperature with a single indwelling catheter.

Methods Employed: Collaboration with the Scientific Research Instruments Corporation of Baltimore, under a contract from NIH/DRS to develop the catheter system.

Major Findings: The prototypes built (3mm O.D.) behaved reliably with respect to membrane properties, i.e., P_{O_2} and P_{CO_2} measurements and thrombogenicity in arterial blood flow, and accuracy and stability of temperature measurement. Occasional erratic behavior was observed with pressure transducer. Zero drift and prototypes with a smaller, more reliable pressure transducer are desirable.

Significance to Biomedical Research and the Program of the Institute: The availability of a single catheter which provides P_{O_2}, P_{CO_2}, pressure and temperature would be valuable in intensive care units, anesthesiology, and physiological research.

Proposed Course of Project: Contract has been terminated because of lack of funds. If additional funds become available, construction and testing of prototypes using a smaller pressure transducer (total catheter O.D. 2mm) would be desirable.

Honors and Awards: None.

Publication:

Fergusson, G.J., Petroff, C.P., Johnston, W.H., Zapata, A., Kleiman, B.S., and Gabelnick, H.L.: Multi-parameter intravascular catheter. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p. 83.

Serial No. DRS-BEIB-10
1. Biomedical Engineering and Instrumentation Branch
2. Electrical and Electronic Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: X-ray Video Recording, Processing, and Display for Cardiovascular Research and Therapy

Previous Serial Number: DRS-BEIB-12

Principal Investigator: William H. Schuette

Other Investigators: Melvin Marcus, Willard C. Whitehouse

Cooperating Units: C-NHLI, ADM-CC

Man Years:

Total:	0.3
Professional:	0.3
Other:	.0

Project Description:

Objectives: To enhance data acquisition, recording, and information display of dynamic cardiovascular phenomena via new techniques of X-ray signal processing with video systems.

Methods Employed: The video planimetry capability has been extended to allow more human interaction to enable processing low S/N ratio data. A special purpose analog computer has been built to give real time volume from measured lengths and areas. The video densitometer capability has been adapted to the measurement of the regurgitant flow index of aortic valves.

Major Findings: This system provides the best available means for acquiring, storing, and processing pressure-volume data from human hearts. It is also useful for diagnosing various defects, such as regurgitant flow and deterioration of prosthetic devices.

Significance to Biomedical Research and the Program of the Institute: The acquisition of pressure-volume data now takes place for all patients undergoing cardiac catheterization at the NIH. The system is useful for general research on cardiac function and its diagnostic capability facilitates better patient care.

Proposed Course of Project: Widespread use of the system will continue, with addition of new features as required. The next major step will be incorporation of a video disc recorder, which will allow reduction of the frame rate, and hence radiation dosage, to near the minimum required theoretically by Shannon's sampling theorem.

Honors and Awards: None.

Publication:

Marcus, L., Schuette, W., Whitehouse, W., Bailey, J., Glancy, D.L., and Epstein, S.E.: Automated method for the routine measurement of ventricular volumes. *Circulation* (in press).

Serial No. DRS-BEIB-11
1. Biomedial Engineering and Instrumentation Branch
2. Mechanical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Investigation of Muscle Dynamics

Previous Serial Number: DRS-BEIB-13 (1970)

Principal Investigators: Melvyn N. Kronick, Jay B. Wells

Other Investigator: None.

Cooperating Unit: MN-NINDS

Man Years:

Total:	1.5
Professional:	1.5
Other:	.0

Project Description:

Objective: To make a quantitative investigation of mechanical properties of muscle tissue.

Methods Employed: Preprogrammed muscle length and/or force levels are imposed by means of an electromechanical actuator operated in a feedback control sytem configuration.

Major Findings: Dynamic properties of the new measurement system enable observation and study of active frog sartorius muscle preparations with unprecedented speed, accuracy, and precision.

Significance to Biomedical Research and the Program of the Institute: A new tool has been developed for the muscle physiologist which is flexible, inexpensive, and easy to reproduce. It enables him to investigate events on a heretofore inaccessible short-time scale.

Proposed Course of Project: Experiments will be done on "slower" muscles to verify and extend results obtained to date.

Honors and Awards: None.

Publication:

Kronick, M.N., Simon, G.A., and Wells, J.B.: Transducer for studies of active muscle. In Proceedings of the 23rd Annual Conference on Engineering in Medicine and Biology 1970, Washington, D.C., vol. 12. Washington, D.C., The Alliance for Engineering in Medicine and Biology. G.G. Vurek, Chairman, p. 63.

Serial No. DRS-BEIB-12
1. Biomedical Engineering and Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Investigation of Laser Holography for 3-Dimensional Study of Cellular Growth

Previous Serial Number: None.

Principal Investigators: Grant C. Riggle, James A. Dvorak

Other Investigators: None.

Cooperating Units: LPD-NIAID, SURG-NCI

Man Years:

Total:	0.6
Professional:	0.3
Other:	0.3

Project Description:

Objectives: To measure mass changes of cells when invaded by a parasite-protozoa. Study reorganization, reproduction, and differentiation of parasite after cell invasion.

Methods Employed: Determine whether laser holography may be of use in studying the *in vivo* developments listed above. Determine laser wavelengths which will permit holographic studies without affecting the physiological processes of the cells and the parasite.

Major Findings: Project under investigation; no significant results to date.

Significance to Biomedical Research and the Program of the Institute: Can provide a new visualization method to aid in qualitative and quantitative evaluation of the life cycle study of Schagas Disease, an invasion of the autonomic and heart muscle tissue by a parasite protozoa.

Proposed Course of Project: Convene consultants in the fields of laser microscopy and holographic reconstruction to determine if project is feasible. Obtain commercial laser holographic equipment and adapt system to project needs.

Honors and Awards: None.

Publications: None.

Serial No. DRS-BEIB-13
1. Biomedical Engineering and
Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: Utility of Lasers in Biological Research and Clinical Applications

Previous Serial Number: DRS-BEIB-17 (1970)

Principal Investigators: Grant C. Riggle, Alfred S. Ketcham

Other Investigators: Woodrow F. Stotler, Robert C. Hoye

Cooperating Unit: SURG-NCI

Man Years:

Total:	0.4
Professional:	0.3
Other:	0.1

Project Description:

Objective: To investigate laser effects on biological tissue through controlled means of energy delivery.

Methods Employed: Selectively generate various patterns of energy distribution in animal tissues and observe biological reactions.

Major Findings: Experimental protocol plan near completion, equipment being assembled, no results to date.

Significance to Biomedical Research and the Program of the Institute: Interest in laser energy in biological research and medical therapy continues at a high level. Experience with carbon dioxide and argon lasers, as well as "Q" Switched Neodymium, recommends further exploration of the laser as an analytic and therapeutic tool.

Proposed Course of Project:

(1) Continued investigation of biological effects.

(2) Continued engineering development of laser systems for investigation of cutaneous anomalies and tumor irradiation; continued investigation of necrotic enhancement through optical system improvements to control and direct energy patterns.

Honors and Awards: None.

Publications: None.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1970, through June 30, 1971

ENVIRONMENTAL SERVICES BRANCH Vinson R. Oviatt, Chief

I. SUMMARY

Increased concern with environmental quality was evident throughout NIH during the year. The interest of administration was reflected in the establishment of three NIH committees directly related to ESB activities. These committees are: The Inter-Institute Committee on Biohazards; The Coordinating Safety Council; and the Ad Hoc Committee on Environmental Differential Pay. In addition, a report on environmental working conditions at NIH was prepared at the request of the NIH Director's Office.

Air pollution control activities included comprehensive air monitoring for sulfur dioxide and incinerator stack sampling. A major problem arose at Building 37 where supply air is contaminated with engine exhaust fumes; preliminary investigation indicates that the situation may require major modifications to Building 37's air supply system.

Water pollution control activities involved microbial and chemical sampling of Broad Run at Poolesville and the NIH stream in Bethesda. Considerable effort was expended in attempts to improve the efficiency of the existing NIHAC pollution control facility. Pollution sources of the NIH stream were identified and corrective actions proposed.

Montioring for mercury discharges into the sanitary sewer was instituted. Subsequent reductions in NIH use of mercury compounds and increased recycling of mercury have greatly reduced pollution levels in waste water.

The biohazard control program continues to gain in importance and recognition at NIH. The Inter-Institute Committee has served to focus NIH-wide attention on this activity. Additional assistance was provided the program by the Scientific Directors who established policy on the use of horizontal and vertical laminar flow hoods. Substantial ESB staff time was given to consultation with individual laboratories on hazard identification and control and equipment procurement. This assistance was provided the Rocky Mountain Laboratory for the first time. There was also increased consultation with outside laboratories.

Construction of the biological control isolation suite in Building 36 was completed. The emergency decontamination project at the Auburn Building following an outbreak of tuberculosis in a sub-human primate colony was of particular note.

Environmental and laboratory epidemiological assistance was provided the Infection Control Committee of the Clinical Center for two patient infection problems. One problem involved a continuing series of Salmonella infections, with particular emphasis on Salmonella cholera-suis. The second involvement was with Herellea vaginicola infections associated with respiratory assist equipment. The latter is of particular interest as Herellea vaginicola to this time had been considered a rather innocuous environmental contaminant. The Salmonella problem was found not to be of environmental origin. The establishment of cleaning procedures and water standards for cold steam humidifiers and bottle-type nebulizers assisted in control of the Herellea vaginicola problem. The Clinical Center surveillance protocol was revised during the year.

Training programs for select NIH employee groups were increased in scope and number in an effort to institute improved procedures and practices. Ten new courses were developed.

The seasonal variation of water quality supplied to NIH, plus the continuing demand for additional quantities of high purity water by investigators demanded increased staff efforts. Problems in addition to our unreliable water source include the inability of investigators to predict either quality or quantity of high purity water needed.

II. BRANCH PROGRAMS

A. Objective

The Environmental Services Branch objectives at NIH and its field stations are:

1. To locate and solve environmental problems.
2. To provide a safe, compatible environment for patients, staff, and the surrounding community.
3. To promote an environment conducive to a quality research program.

B. Current Programs

Attainment of the Branch objectives was approached through the following closely coordinated program areas.

1. Biohazards and Contamination Control

The biohazards and contamination control program is aimed towards promoting a safe environment for personnel and protection to research work at all NIH facilities in Bethesda and in the field. The basic approaches followed in dealing with potentially hazardous laboratory and animal room areas are regular surveillance of Institute programs, control equipment, and facilities; and development on a case-by-case basis of laboratory arrangements needed to protect the investigator and the public.

2. Industrial Hygiene

The industrial hygiene program is devoted to the recognition, evaluation, and control of environmental factors or stresses which may cause sickness, impaired health and well-being or significant discomfort among workers or citizens of the community. Major workload is related to both gaseous and particulate air contamination potentially or actually generated at NIH. Problems connected with noise, temperature extremes, and non-ionizing radiation are also part of this program.

3. Hospital Sanitation

The hospital sanitation program in the Clinical Center is aimed at the protection of patients from environmental influences which could contribute to nosocomial disease. It encompasses the regular visual and microbial surveillance of patient treatment and care areas as well as relevant support departments.

4. General Sanitation and Sanitary Engineering

The general sanitation and sanitary engineering program is concerned with basic environmental factors which affect the health of NIH employees and visitiors. These factors include the food sanitation, water supply, solid and liquid waste disposal, housekeeping practices, pesticides, and water pollution control.

5. Environmental Studies for Support of Research and Patient Care

Continuing environmental studies are conducted as a necessary adjunct to surveillance and consultation activities. Studies are oriented to environmental systems and problems; evaluation of new equipment and methods; provision of quality glassware, animals, and water; environmental stresses related to light, heat, noise, food, water, and waste; and the identification of environmental contaminants.

6. Training

An extensive training program is provided for the benefit of both ESB personnel and staff members at NIH. All professional and technical staff of ESB attend relevant short courses and/or formal academic programs at local colleges and universities. Environmental control devices and practices related to the general research environment require special training for proper operation and handling. Therefore, ESB personnel conduct continuing programs for NIH employees in a variety of problem areas.

C. Program Progress and Accomplishments

1. Biological Control

Major progress was made in the development of a NIH-wide biohazard control program. A staff paper was prepared outlining essential program elements of biohazard control program to include the establishment of a NIH biohazard committee, the registration of biological agents, employee health surveillance, training programs, and the centralization of consulation activities. As a result, the Inter-Institute Technical Committee on Biohazards was established to develop a comprehensive biohazard control program for the consideration of the Scientific Directors. ESB is providing support staffing for this committee.

The Scientific Directors further aided the biohazard control program by resolving that horizontal laminar flow hoods would not be approved for biological work in laboratories and directed that only vertical laminar flow hoods or safety cabinets would be used for this type of work.

The staff spent a major portion of its time in consultation with NIH laboratories in assessing potential biological hazard problems and equipment use and procurement. Specifications were developed for biological laminar downflow hoods to facilitate procurement procedures. Twelve laboratories were labeled with the biohazard symbol as outlined in PPM #16. An increasing number of requests for biological control procedures were received from "outside" research laboratories, universities, and manufacturers.

Emergency decontamination capability was demonstrated following a tuberculosis outbreak among Rhesus monkeys housed in the Auburn Building. The outbreak necessitated decontamination of one-half of the ground floor of the building. The project was performed after working hours, requiring approximately 180 man-hours. The procedure was so carried out that research work on the upper two floors of the building was uninterrupted.

The involvement of the Branch with the construction of the isolation suites in Building 36 was continued. The Branch provided consultation to CEB:OES on biohazard control aspects. Inspection and acceptance testing of components were performed to assure integrity of barrier systems, equipment performance, and certification of filters. When the facility was occupied in early 1971, staff orientation was provided to explain proper use of the containment suite.

The first visit to Rocky Mountain Laboratory to look specifically at biohazard problems in the laboratory was made. Improved containment equipment to protect the bench worker and associated upgrading of the building ventilation system and alteration of space to accommodate hoods is an urgent need at this facility.

2. Industrial Hygiene

The air pollution surveillance program included automatic monitoring for sulfur dioxide at various buildings; compliance testing of the NIH incinerator; and identification and solution of local building problems. The sulfur content of available fuel used for the power plant boilers is now double that which NIH was previously able to obtain. The sulfur dioxide surveys at air intakes of the Clinical Center and other buildings reflect this increase. The incinerator testing indicated that incinerator emissions met federal standards when air cleaners are in operation. The incinerators, however, do not meet the proposed Montgomery County Standards. It should also be pointed out that the air cleaners are inoperative 30 percent of the time.

A severe problem of supply air contamination by truck and automobile exhaust at Building 37 is being studied cooperatively with the Office of Engineering Services. The first phase of the study involved use of a mockup air intake modification attached to the building. Results showed that this approach provided limited improvement. The second study phase involves smoke tests of a building model in the laminar flow room. These test results will define a basis for building modification.

Complaints of air contamination of chemical origin in laboratories and offices involved investigation and evaluation of several ventilation systems. Noise from laboratory equipment and utilities were also investigated. The present disposal of chemical wastes by dilution with tap water before discharge into the sanitary sewer is under review.

3. Hospital Sanitation

Environmental support was provided in investigating the epidemiology of two unusual infection outbreaks among the Clinical Center patient population. This entailed efforts to identify potential environmental routes of transmission of the infectious agents, Herellea vaginicola and several Salmonellae. With regard to the Salmonella outbreak, an in-depth study of all foods, water, and medication used by the Clinical Center patients was conducted to determine the presence of Salmonella cholera-suis. Results of this investigation were negative. However, various species of coliform and Pseudomonas organisms were noted on several occasions.

A major program objective undertaken was to evaluate the feasibility of modifying the recurring Clinical Center monitoring program. Past microbial sampling monitoring procedures were designed to predict hospital environmental contamination problems. The system has not served this purpose; therefore, the program emphasis was redirected to place reliance on physical assessment of and oral communication with key hospital departments. Microbial surveillance is used mainly as an epidemiological investigative tool. The new approach will be evaluated in depth in FY 1972.

4. General Sanitation and Sanitary Engineering

The eventual transition from use of the present NIH incinerator to the new Forest Glen Tri-Service facility presents serious "in-house" solid waste management problems. An assessment has been made of available equipment and facilities and a program to ease possible transition "pains" recommended. Key problems which need further attention relate to the most effective use of the Clinical Center waste chutes and acceptance of paper bags in lieu of GI cans for waste containment.

Progress in controlling pollution at the NIHAC has been hampered by the delay in construction of the new water pollution control facility. However, increased efficiency was obtained in the existing system by removal of sludge deposits and operation of the lagoons in series.

Evaluation of stream pollution from NIH sources was completed. Construction of an all-purpose equipment and vehicle washing facility at the NIH campus is necessary to control pollution of the NIH stream. Until vehicle washing is removed from storm sewer catch basins, intermittent pollution of these streams will continue at NIH.

The wide-spread concern for mercury in the environment was experienced at NIH. Sampling for this pollutant in NIH waste water began in November and continues. Initial determination indicated a high (but below federal limits) concentration. NIH efforts to eliminate or re-cycle mercuric compounds have resulted in dramatically reduced pollution level in the waste water.

An intensified program of regular food service investigations was continued at commercial suppliers, GSI cafeterias, and the Maryland Workshop for the Blind snack bars. Difficulty has been encountered in bringing vendors into compliance with PHS Standards. As an adjunct to the survey program a microbial examination of snack bars and vending machine foods was instituted.

Animal room surveys made in cooperation with LAB were conducted for NIMH, NICHD, and NHLI. This is part of a plan to assure that NIH animal rooms meet with AAALAC Accreditation Standards. Increased attention was given animal rooms in the Clinical Center to control general environmental contamination problems.

5. Studies

The staff was involved in several studies of value to the scientific community as well as to immediate operating programs at NIH. Some of these were:

a. The development of a prototype vertical laminar flow hood to provide greater work flexibility and to accommodate a special laboratory apparatus is being carried out through the contract mechanism.

b. Methods for the concentration of virus from dilute solutions are being evaluated to establish practical ways to handle environmental samples.

c. Preliminary tests are being performed on several resistant viruses to determine the effectiveness of some commonly used chemical disinfectants for decontamination work. Interest is centered on a few of the animal viruses in the picornavirus group that may be resistant.

d. A study of spray coil humidifiers was initiated after reports in the literature indicated that certain types of this equipment have been associated with environmental contamination. The study is being done in Building 14-G and has direct application to a planned NIHAC facility.

e. The atomic absorption technique for detection of mercury in waste water and other environmental samples was instituted in the ESB laboratory.

f. A cooperative program with the Inhalation Therapy Service, Clinical Center, revealed several problems involving patients in the Clinical Center. *Herellea vaginicola*, a gram negative organism, has been identified in cold steam humidifiers and as a secondary contaminant in respiratory infections in several patients. Studies are presently being conducted to determine the most satisfactory method for maintaining sterile humidifying units and hoses.

g. Studies were carried out to determine the most efficient disinfectant for use in the Clinical Center.

h. A cooperative study is in progress with NCI and the Smithsonian Institute for chemical determination of pesticide traces in fish tissue. Experience gained will enable ESB to develop techniques for the monitoring of pesticide application.

i. A study to determine the relative digestibility in sewage of various animal bedding materials under aerobic and anaerobic conditions was initiated. The purpose is to assess the possible effects of these materials on the existing and proposed wastewater treatment and disposal facilities at the NIH Animal Center.

j. Seriological studies of microbial isolates of Serratia marcescens from the Clinical Center were evaluated. A hemagglutination technique and typing scheme for these organisms were developed. Methods were also developed to screen normal human sera for Serratia antibody levels. Epidemiological investigation of Serratia isolates indicated 65 percent were from cancer patients. The lowest number of isolates (6.5 percent) was from neurological disease patients.

6. Training

a. A Laboratory Technician Trainee was hired to fill a position allocated to help implement the NIH Affirmative Inservice Development Program. The training consists of informal instruction in virology and work experience in the bacteriology and virology laboratories. The trainee is supplementing on-the-job training with formal off-campus courses at U.S.D.A. and Montgomery College.

b. An animal care training course consisting of 12 four-hour sessions was presented jointly with LAB. I/D and LAB animal caretakers attended.

c. A total of 393 support service personnel in OES, NIH housekeeping, and pest controllers received one hour of instruction to increase the overall awareness and understanding of the program to identify biological hazard areas.

d. Twelve (monthly) one-hour lectures on hospital environmental control were presented to new Nursing Department employees as an element in their job orientation. Two four-hour courses of the same subject material were presented to non-professional nursing personnel in the Clinical Center.

e. Ten training programs for NIH personnel were developed, six of which were instituted. They are

(a) Environmental Health for Glasswashing Personnel

(b) Environmental Health for Insect and Rodent Control Personnel

(c) Principles of Environmental Health for Plumbers

(d) Sanitation for Animal Caretakers

(e) Environmental Health for Nurses

(f) Environmental Health for Nurses Aides and Unit Clerks

(g) Environmental Health for Waste Water Treatment Operators

(h) Principles of Sanitation for Housekeepers

(i) Safety in Laboratory

(j) Biohazards Training for Selected Workers

D. Problems

The seasonal variation of water quality supplied to NIH, plus the increasing demand for high purity water for use in various research and operation areas presents a critical problem. During the past year the amount of time expended in solving high purity water problems was increased over that of the preceding years. In addition to ESB time expended, an increasing amount of funds are expended by PEB on procurement and maintenance of water purification apparatus. Problems in addition to the unreliable source of water include the inability of investigators to predict water needs (quality and quantity) and the unreliability of distillation and deionization units.

Planning and developmental work, including specification writing, associated with biohazards facilities and equipment requires extensive personnel time. With the increasing attention to biohazard control and the need for improvements, it seems evident that a larger part of the NIH budget will be spent on this program. The present staffing is not adequate to handle an increased workload and perform at a high-level of competency.

Surveillance of the NIH operations and environment does not have the capability for prediction of problems. Staff operational procedures need to be developed for optimal liaison with Institutes and Divisions. There is also need for development of a systematic identifcation of environmental indicators.

E. Program Plans

1. Program Plans Related to Major Problems

The basic environmental surveillance program will be restructured. Parameters to be included are redirection of I/D liaison, use of employee health data, workload trends (Data Reporting System), investigation of additional automated monitoring equipment, and increased use of data processing programs in an attempt to better identify NIH environmental needs.

To cope with the ever increasing specialized monitoring and maintenance of biological safety cabinets (hoods), high efficiency filters, and other biocontrol systems, consideration is being given to negotiation of a service contract for this work. Other R&D contracts are planned to solve special equipment and operational problems.

A study is to be instituted of the requirements and specifications for high purity water for the NIH patient areas and research laboratories. The study will develop specifications for various grades of water, the components for the equipment necessary to obtain water of the designated quality and its storage and transport.

2. Program Plans Related to Branch Objectives

It is contemplated that the number of training programs presented by the Branch for NIH personnel will be increased. It is envisioned that in addition to present programs that individuals handling infectious and toxic wastes, laboratory chemicals, and those working in areas having physical hazards, such as heat or noise, will receive instruction.

Demands for an expanding biohazard control program will continue with the increased interest shown by NIH investigators. In addition to strengthening existing facets of the present program, emphasis will be placed on developing methodology for the environmental sampling and detection of viruses.

Testing of new equipment design will be required to verify containment performance. A procedure will be developed utilizing a biological test agent under static and dynamic conditions.

Pollution control programs will also receive high priority. The program will include control for air, water, and chemical pollutants. A base-line survey of air and water quality will be conducted in the Forest Glen area in preparation of the opening of the Tri-Service incinerator. The pesticide and herbicide programs will be reviewed and upgraded.

A comprehensive decontamination and sterilization program is planned. This program will include a survey of disinfectants used at NIH and the policy for their use. Purchasing specifications and practices will be reviewed. Laboratory tests to determine the microbial and viricidal effectiveness of selected compounds will be conducted. The project will result in the publication of a NIH operational bulletin on decontamination chemicals, use dilutions, recommended policy, procedures, methods of application, and possible development of vendor specifications.

Major engineering efforts will be directed toward the balancing of air supply and fume hood exhaust systems in the Building 10 laboratory wings.

A program to isolate and separate pathogenic and non-pathogenic strains of _Serratia_ species from humans, animals, sewage effluent, and the environment is to be instituted.

The laboratory will continue disinfection testing procedures to identify bactericidal and bacteriostatic effects of compounds and to identify resistant and sensitive organisms.

A Salmonella surveillance program is to be maintained on milk and poultry products, vending machine products, and prepared animal feeds.

F. Publications

Malone, W.F.: Studies Utilizing a Microtiter System for Quaternary Ammonium Compound Disinfection. Proceedings Chemical Speciality Manufacturers Association. 21-34: 1971.

Morrison, R.P.: Surveillance of Patient Areas. Hospitals. 45: 110-117, 1971.

Wilkinson, T.K., Powell, C.H., Bell, H.E., Rose, V.E., Goldman, L.: Current Status of Laser Threshold Guides. J. Am. Ind. Hyg. Assn. 31: 1970.

Powell, W.V.: Biological Hazards in the Research Environment. J. Am. Col. Health Assn.: 1971

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1970, through June 30, 1971

LABORATORY AIDS BRANCH Dr. Joe R. Held, Chief

I. SUMMARY

There were increases in FY 1971 in the issues of laboratory bred dogs and cats, bacteriologic media, and laboratory glassware. The level of production remained about the same or slightly decreased for tissue culture cells, rabbits, and dog blood. The number of primates, random source dogs, and ungulates purchased and conditioned remained at about the same level as in past years while the number of random source cats decreased sharply. There were marked increases in the use of experimental surgery services and facilities and the use of facilities for the holding of experimental dogs. While rodent issues to the I/D's remained about the same as in past years, in-house production was decreased and supplemented through contracts for their purchase. Those decreases that did occur are thought to be a reflection of budgetary restrictions within the individual Institutes and Divisions.

Additional consultative services are being made available to the I/D's, and plans are being made to increase the services even more in the future. A new program, the Animal Disease Investigation Service (ADIS), was initiated toward this end. Although only a few months old, the program has been well received by the I/D's and appears to be making significant contributions toward the improvement of animal health at NIH. Several disease conditions were investigated and controlled. In many of these, detailed multi-disciplinary studies were required and the information gathered will be useful, not only to the NIH, but to the biomedical research community in general.

II. BRANCH PROGRAMS

A. Objectives

The primary objectives of the Laboratory Aids Branch are:

1. The issuance of research animals, animal biologics, tissue cultures, tissue culture media, bacteriologic media, and laboratory glassware.

2. The provision of facilities and professional staff for experimental surgery to include postoperative care and roentgenography and other special procedures.

3. The maintenance of animals during experimentation.

4. The acquisition of information, through research, on animal health, care, and husbandry.

5. The provision of consultative services on animal health and husbandry, use of experimental animals, tissue cultures, and bacteriologic media.

B. Current Programs

1. Production and Conditioning

a. Animal Production

A variety of rodents, rabbits, dogs, cats, and primates are produced. Some of these are characterized genetically and some are microbiologically defined. Care is taken to maintain the genetic integrity of inbred strains and minimize inbreeding of random bred stocks. Germfree and specific pathogen-free (SPF) rodents are produced for intramural research programs requiring them and for replacement breeders to enhance the health status of production and genetic colonies.

b. Animal Procurement and Conditioning

Primates, dogs, cats, and feral animals are procured and conditioned. Generally, these animals can neither be characterized genetically nor well-defined microbiologically; and they are of lower quality than NIH-bred animals, but their cost is less and they are adequate for many studies. These species are held for a period of several weeks before thay are issued, during which time they are clinically examined and tested for a variety of infectious agents. Treatments and immunizations are administered when indicated during the conditioning period.

Rodents are procured through contracts to supplement in-house production. They are delivered directly to NIH investigators. Quality control of these species is maintained through monitoring of the various producers' facilities and operations by Branch staff members.

c. Tissue Culture and Media Production

A variety of continuous cell line tissue cultures are maintained, propagated, and produced in large volumes to supplement I/D requirements not met by commercial sources or individual laboratory preparation. Media for the culture of bacteria, fungi, and tissue cells are produced to meet the needs of NIH investigators. A stringent quality control program insures that only high quality products, free of contamination and true to formulation, are issued. As a service to investigators, valuable cell lines are frozen and stored for long-term preservation.

d. Processing Laboratory Glassware, Animal Cages, and Miscellaneous Items

Laboratory glassware is decontaminated, sorted, cleaned, inspected, plugged, wrapped, sterilized, and issued to NIH investigators. The overall operation includes processing of used glassware received from investigators and the introduction of new glassware from replacement stock. In addition to cleaning animal caging for its own programs, the Branch furnishes cagewashing services to investigators in the Clinical Center, the Auburn Building, and the Patuxent River Laboratory. Clinical Center rubber-backed carpets are also washed. A service is provided for ethylene oxide sterilization of heat labile patient and laboratory equipment from the Clinical Center and other I/D's.

e. Animal Biologics Production

A dog blood donor colony is maintained for the production of A-negative blood for research use. Ungulates are maintained to produce a variety of antisera, blood, and tissue specimens for investigators. RIF-free and Marek's disease-free eggs used in NIH research are produced from flocks of chickens free of these agents maintained in isolators.

2. Experimental Surgery, X-ray and Related Activities

Facilities are provided for investigators to perform experimental surgery on any size domestic animal. These facilities include modern equipment for the proper anesthesia, handling, and physiological monitoring of experimental subjects under aseptic conditions. Upon request, staff members will perform special surgical procedures for investigators needing surgically prepared animals for their studies. Radiographic facilities and services are also made available for use on animals of any size.

3. Animal Holding

Dogs and ungulates are held for varying periods of observation while under test by NIH investigators. Provision is made for physiological sampling and collection of specimens.

4. Research and Disease Investigation and Control Within LAB

The professional staff consists of persons trained in general clinical veterinary medicine and specialists in laboratory animal medicine, pathology, microbiology, epidemiology, genetics, nutrition, animal husbandry, mammology, and ecology. The efforts of these persons are oriented toward improving the Branch's programs by gaining new knowledge through research and the application of the best available procedures to meet the objectives of the Branch.

5. Consultative Services

Information and assistance is available to NIH investigators for the solution to problems relating to animal experimentation, health, care, and husbandry. Through the Animal Disease Investigation Service (ADIS) "house calls" are made to the I/D's to provide investigators with clinical veterinary services for their research animals. There is also a program in which the primary goal is to furnish each I/D a comprehensive review of its animal care programs with evaluations and recommendations for improvement. Consultative services are available regarding the use of tissue cultures and microbiologic medias.

C. Program Progress and Accomplishments

1. Production and Conditioning

a. Animal Production

A program was completed to establish hysterectomy-derived, barrier-maintained foundation colonies of all strains and stocks of LAB rats. The rat production colonies were moved to a clean production area and all colonies are now monogamously mated in filter-covered plastic cages. The harem mating system in general purpose cages was discontinued and a major improvement in reproduction performance was observed. Much of the improvement is attributed to the elimination of contagious respiratory disease to which certain strains had been particularly susceptible. Problems of alopecia and loss of term pregnant females occurred. These are suspected to have occurred because of nutritional deficiencies produced by feed sterilization. The colonies were routinely monitored for the presence of Mycoplasma and one inbred strain was found to be infected. The infection was eliminated by reintroduction into the barrier of a new group of the same strain of animals.

A similar program to establish hysterectomy-derived, barrier-maintained mouse strains was initiated in January. Most of the strains have been successfully derived and foster reared. Some have been introduced into the barrier; however, it will require a year before substantial numbers can be issued from the new colonies.

Studies were initiated to develop techniques and diets to establish hysterectomy-derived rabbit foundation colonies. If successful, these techniques will facilitate the elimination of disease from the colony.

Studies were continued for the development of an SPF hamster. The Mystromys was established in SPF isolators and attempts are being made to foster-nurse hysterectomy-derived hamsters on these animals.

Increased production of Strain 13 guinea pigs was initiated to better meet the requirements of investigators. A new room was equipped and stocked with breeders during the year and a new mating system is being evaluated.

The canine breeding colony presently consists of 113 bitches and 7 dogs and can be expected to produce about 700 dogs per year. Further expansion will not be possible in the space currently dedicated to this activity.

To provide more space for dog breeding, the cat breeding colony was reduced from 90 to 40 queens. Fifteen toms are currently maintained. Efforts are underway to improve the physical facilities and to gain information which will permit more efficient breeding. About 340 cats will be issued from the colony during FY 1971.

The primate breeding colony was enlarged to 65 females. During the first nine months, 32 females were impregnated. Offspring or the pregnant females of these breedings were issued to investigators. It is anticipated that the number of females will be increased to approximately 150. To increase breeding efficiency, attempts are being made to reliably induce ovulation in rhesus females.

Cream colored hamsters, gold colored hamsters, flemish rabbits, Holtzman rats, Lobund rats, and NIH Black rats were phased out due to a lack of use by investigators. Reduced usage of NIH-produced animals resulted in the reduction in colony size of 14 rodent strains and stocks.

b. Animal Procurement and Conditioning

Slightly more than 3,000 primates will be conditioned and issued this year, a level similar to that in FY 1970. The price of rhesus monkeys purchased under a new contract effective January 1, 1971, decreased by 33 percent from the previous contract. Mortality of newly imported monkeys during the conditioning period was 6 percent versus 9 percent for FY 1970.

A program to purchase 30-day conditioned random source dogs was continued. This reduced space requirements for the random source dog colony and made more space available for growing specially reared foxhounds. Problems of parasitism and inadequate supplies of dogs from the vendor encountered early in the program were overcome. Procurement of partially conditioned dogs substantially reduced the incidence of disease problems within the random source dog colony.

About 2,050 random source cats are expected to be issued in FY 1971. This is about 15 percent below FY 1970, and probably reflects a slight reduction in the use of cats and an increase in issues of laboratory reared cats. The cat conditioning program was changed during the year to include treatment of all cats for endo and ecto parasites.

c. Tissue Culture and Media Production

Based on the first eight months of FY 1971, the number of requisitions processed for tissue culture and media will total 13,500; a slight increase over last year. The volume of media produced will be 62,000 liters of bacteriologic media and 54,000 liters of tissue culture media for a total of 116,000 liters. This represents an increase of 23 percent over last fiscal year.

Automated tubing and bottling equipment made it possible to meet the increased demand for these products. A commercial contract for the supply of blood agar plates was terminated midway through the fiscal year because of problems with the supplier and a willingness of NIH investigators to use plates prepared with sheep blood rather than rabbit blood. In addition to purchased plates, a total of 303,000 plates will be produced this year.

The number of tissue culture cells furnished in tubes further decreased this year to 11,000 tubes of various cell types produced per week. Cells are now more commonly dispensed in larger volumes. In addition to those dispensed in tubes, a projected volume of 135 liters of cell suspension, sufficient in quantity for 135,000 tubes, will be produced.

Demand for the tissue culture cell freezing and storage service continued to increase. A charge for this service was initiated at the beginning of the fiscal year and projected figures indicate that over 3,000 ampoules of cells will be frozen for various investigators. There is a need for additional liquid nitrogen storage space to keep pace with the demand. Plans are underway to add the necessary equipment late in this fiscal year.

The trend toward automation of media production continued with the addition of an automatic plate pouring machine and a portable agar sterilizer. These units will make possible issues of selected agar plates from stock. This will provide more economical production as well as added convenience to investigators.

The contamination rate for tissue culture media was further reduced by continued emphasis on proper quality control procedures. From the previous year's low of 1.2 percent, there was an additional rate decrease to 0.55 percent during FY 1971.

Cell lines of documented passage history were obtained from the American Type Culture Collection. Eventually all cell lines will be similarly replaced to provide a verifiable source for tissue culture cells.

d. Processing Laboratory Glassware, Animal Cages and Miscellaneous Items

Glassware issues to the Institutes and Divisions will total about 10,613,000 pieces. This represents a 4.7 percent increase over FY 1970. A total of 296,000 cages, racks, and associated pieces of equipment will be processed. This does not include carpets washed for the Clinical Center.

Two automatic pipette pluggers were put into operation. These machines can plug more pipettes in two hours than two persons using two manual machines in eight hours.

The output of screw cap tubes was doubled by changing the method of rinsing. The new method also eliminates a problem of chipping the neck of the tube.

A number of safety measures were put into effect. Safety glasses and protective uniforms were issued to personnel. A battery-powered tractor for handling large volumes of glassware eliminated the pushing of trailers by hand.

e. Animal Biologics Production

A small flock of normal chickens was established to provide avian blood and blood products to NIH investigators.

2. Experimental Surgery, X-ray, and Related Activities

The number of surgical procedures performed and the number of hours devoted to surgery increased. This year, 700 procedures are projected, which is a 75 percent increase over last year and an increase of 15 percent over the period between 1966 and 1969 when the mean number of procedures performed was 608 per year. Radiographic services increased markedly from a mean of 50 procedures per month during the second half of FY 1970 to 161 per month this year--an increase of over 200 percent.

The long-term dog holding population has increased by 30 percent. Last year the average population was 220 dogs per month; this year the average monthly population is 290 dogs.

3. New Animal Models Program

A program was initiated to assist investigators in obtaining new animal models to meet previously unfulfilled research needs. In some instances, this involves the inclusion of new strains of existing laboratory animals exhibiting unique physiologic or anatomic characteristics. In others it involves the adaptation from nature of animals having characteristics that might lend themselves to a particular research problem. New models introduced were a hamster strain with a myocardial defect; three species of Japanese mice with varying abnormal levels of urinary protein; inbred rabbits to provide immunologic researchers with a genetically-defined animal model; and wild raccoons for parasitology research. It was determined that there is a need for cottontail rabbits as a host for rabbit fibroma and lymphoma viruses, and preparations were made for the inclusion of this species.

Production was initiated to supply investigators with a complement-deficient (C-4) guinea pig strain. The recognition and inclusion of this strain as a potentially useful research tool had taken place earlier.

4. Animal Disease Investigation Service

An Animal Disease Investigation Service (ADIS) was established to provide clinical services to NIH investigators encountering disease problems in their laboratory animals. Six veterinary clinicians were assigned part-time to this service. These clinicians have available to them broad professional resources of senior LAB staff members in fields such as pathology, microbiology, nutrition, and genetics. In the program's first six months there were 60 disease investigations involving consultations with 39 investigators in 10 Institutes. Animal species encountered were varied including rodents, rabbits, primates, carnivores, ungulates, and marsupials. The complexity of these calls also was varied, ranging from the treatment of ear mite infestation in rabbits to controlling an outbreak of tuberculosis in an Institute-owned primate colony. The use of this Service by the research Institutes and Divisions is continually increasing.

5. Animal Nutrition

An open formula diet for conventionally reared mice and rats was formulated. Tests indicated that the new diet is comparable to previously fed, commercially available diets. Using open formula diets will provide greater control in the nutrition of experimental and production colony animals.

A study to test the effect of supplemental feedstuffs and the physical form of the ration indicates that overfeeding may be a factor associated with poor reproductive performance in some strains of inbred mice.

6. Animal Health

An outbreak of a fatal disease in weanling and post-weanling kittens was diagnosed as infectious feline enteritis. Epidemiologic studies indicated that a faulty commercial vaccine failed to properly immunize the animals. After the use of new vaccine, the disease rapidly disappeared from the colony.

Infectious peritonitis continues to occur sporadically in the cat colony. The causative agent, which is presumed to be viral, has not been isolated, and a method to eliminate the disease has not been found. Lesions with cellular characteristics similar to those of infectious peritonitis are now being found in the kidney, central nervous system, and eyes of some cats.

Four sheep were found to have nasal tumors with histopathologic features similar to those of "infectious nasal adenomas" as described in Europe and rarely found in the United States. Although the degree of contagiousness of the disorder has not been thoroughly studied, it is presumed that additional cases may occur.

Paratuberculosis (Johne's Disease) in the goat herd was confirmed microbiologically. In initial testing, six of 109 goats were found to be diseased and were eliminated. Retesting of the goats plus 189 sheep revealed another infected goat. Testing by culturing feces will be continued indefinitely and will be used to screen all incoming animals prior to their introduction into the herd.

A group of rhesus monkeys from a valuable breeding colony suffered an outbreak of tuberculosis. To save as many animals as possible and to protect personnel in the building where the monkeys were being housed, the monkeys were transferred to the primate quarantine and conditioning colony. Strict quarantine was established and, after several anergic animals were discovered, the disease was quickly eradicated by eliminating reactors to the tuberculin test.

Studies continued of the Pasteurella pneumotropica contamination of barrier facilities and certain germfree isolators. Current data suggest, contrary to popular belief, that P. pneumotropica is primarily an intestinal agent which only sporadically infects the respiratory tract and uterus. The demonstration of uterine infections in both conventionally reared animals and experimentally infected germfree animals has pointed to vertical transmission as the probable means of spread of the agent to isolators and barrier rooms. Since P. pneumotropica is a recognized pathogen of laboratory animals under a variety of ill-defined conditions, the discovery of latent intestinal infection is a finding of major importance.

Mycoplasma infection of germfree rats was eliminated. This was accomplished by developing a means of testing for infection in live animals. All animals found positive on culture were eliminated.

Tyzzer's disease still occurred endemically in the NIH rabbit colony. Studies of the causative agent, Bacillus piliformis, resulted in the development of methods to obtain large amounts of the unstable vegetative form, free of spores. To date, all efforts to preserve the vegetative form outside of living cells have been unsuccessful.

Pregnancy toxemia of guinea pigs was characterized after several years of study as a syndrome of precipitous body fat mobilization and ketosis resulting from stress-induced inappetence. Obesity was found to be a major predisposing condition.

D. Problems

Problems of animal disease are referred to elsewhere in this report. (See Part II, C, 6.)

The completion date of the new primate building was delayed by more than six months which, in turn, created a number of problems related to staffing and equipping the building. New cages for the building were of poor quality workmanship and a large number of man-hours were expended to obtain a resolution to this problem.

There is a serious understaffing problem, in spite of existing contracts to reduce levels of in-house production. The problem is further aggravated by the fact that many employees are attending authorized classes during working hours. To compensate for this shortage, many employees were required to work an unreasonable number of overtime hours, and several necessary activities, such as the increased production of Strain 2 guinea pigs, were postponed.

The prices for rodents were raised by 10 percent in the middle of the year to prevent a large revolving fund budget deficit. This indicates a need for financing research and development, new animal models, strain development, and repository activities from sources other than animal issues.

The lack of sufficient space for more efficient and expanding media and tissue culture operations becomes increasingly more pressing.

The return of improperly labeled, potentially hazardous dirty glassware continues to be a problem in spite of efforts to enlist the consideration and cooperation of users.

E. Program Plans

An increased effort will be made to determine more precisely the changing requirements of the Institutes and Divisions for tissue culture cell production. To improve the quality control of all types of media, osmolarity will be regularly measured.

Automation will be increased in glassware preparation by the addition of a tube plugging machine. Plans are underway to use a disposable container for issuing pipettes.

The program to free all mouse strains and stocks of disease through hysterectomy derivation and barrier maintenance of foundation colonies will continue. In addition, development of techniques for applying this practice to other species will be undertaken. This will require a cooperative effort in areas of nutrition, microbiology, and genetics and the development of methods for hand and foster-nursing hamsters, rabbits, and guinea pigs. Reference stock and genetic repository functions will receive increased emphasis.

New strains of animals in danger of extinction and having significant potential for research will be added to the colonies. An attempt will be made to support this activity from the Management Fund rather than the Revolving Fund. This is necessary because the decreased in-house production activity can no longer support research, development, reference stock, genetic repository, and new animal model activities and still maintain reasonable prices for animals produced.

Studies aimed at the elimination of feed supplements to laboratory rodents will continue. Experimental rations varying in protein and fat concentrations will be used to determine specific requirements of these nutrients for various strains of inbred mice. Studies will be designed to determine the effect of autoclaving on nutrients. An effort will be made to improve the diets fed the dog and cat colonies.

A system of recording the morbidity, mortality, and general health status of the colonies more accurately is being developed. This will aid early detection of disease and will provide epidemiologic information necessary for the accurate study of disease processes.

It is planned to establish a small colony of African pygmy goats and a herd of dairy goats to produce better quality animals than those available from outside sources.

The needs of NIH investigators for RIF-free eggs and genetically susceptible or resistant birds will be more precisely determined and production modified accordingly. A system of charging for these eggs will be proposed.

F. Publications

Ganaway, J.R. and Allen, A.M.: Obesity predisposes to pregnancy toxemia (ketosis) of guinea pigs. Lab. An. Sci. 21: 40-44, 1971.

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Kaufmann, A.F., Alexander, A.D., Allen, A.M., Cronin, R.J., Dillingham, L.A., Douglas, J.D., and Moore, T.D.: Meliodoidosis in imported nonhuman primates. J. Wildlife Diseases, 6(4): 211-219, 1970.

Lopez Adaros, H. and Held, J.R.: Guillain Barre syndrome associated with immunization against rabies: Epidemiological aspects. Res. Publ. Ass. Nerv. Ment. Dis. (In press).

Moore, T.D. and Allen, A.M.: Mycobacteriosis in the opossum. J. Infect. Dis: 123 (In press).

Moore, T.D., Allen, A.M., Ganaway, J.R., and Sevy, C.E.: A fatal infection in the opossum due to a Mycobacterium of Runyon Group IV. J. Infect. Dis: 123, 1971.

Potkay, S., Daggett, W.M., Jr., and Gilmore, J.P.: Role of the Vagus in Body Water Regulation. Amer. J. Physiol. 218: 1333-1337, 1970.

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Potkay, S.: Diseases of the opossum (Didelphis Marsupialis): A review *Lab. An. Care* 20: 502-511, 1970.

Shelokov, A., Tauraso, N.M., Allen, A.M. and Espana, C.D.: Epizootic, clinical and pathological aspects of simian hemorrhagic fever. *Marburg Virus Disease*, Springer-Verlag, Berlin, W. Germany p. 153-157, 1970.

III. INDIVIDUAL PROJECT REPORTS

Serial No. DRS-LAB-1
1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: CHRONIC RESPIRATORY DISEASE OF THE LABORATORY RAT

Previous Serial Number: DRS-LAB-1 (CHRONIC MURINE PNEUMONIA OF THE LABORATORY RAT)

Principal Investigator: James R. Ganaway

Other Investigators: Anton M. Allen
Thomas D. Moore

Cooperating Units: Rodent and Rabbit Production Section

Man Years:

Total:	0.5
Professional:	0.4
Other:	0.1

Project Description:

Objective: To determine the character, cause, and means of preventing this disease complex.

Methods Employed: Microbiology, immunology, and pathology.

Major Findings: Our findings, as well as those published in recent reports from other laboratories, continued to strengthen our hypothesis that several bacteria are responsible for this disease complex. Progress in reporting has been delayed by the continuing commitment to establish the mycoplasma-free status of the cesarean-derived, germfree and barrier rat stocks, where the infection was discovered for the first time during the previous year. This problem stimulated the need to devise a means of detecting active infection in the live rat. To determine this state previously it was necessary to kill the rat, which is self-defeating in a production colony. Accordingly, a method of swabbing the oropharynx under light inhalation anesthesia was tested and found, through followup study, to be very sensitive. As a result of testing and subsequently destroying those rats found positive on culture, the mycoplasma infection of germfree and barrier rats appears to have been eliminated.

Significance: Chronic respiratory disease is the greatest cause of morbidity and eventual mortality in laboratory rats. The cesarean-derived, barrier-maintained rat has previously been considered free of all respiratory infection. We have shown this to be an erroneous assumption. Accordingly, it may be necessary to reevaluate all published reports which could have been influenced by these findings through the use of similar rats.

Proposed Course: Continuation.

Honors and Awards: None.

Publications: None.

Serial No. DRS-LAB-2
1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: TYZZER'S DISEASE

Previous Serial Number: DRS-LAB-2

Principal Investigator: James R. Ganaway

Other Investigators: Anton M. Allen
Thomas D. Moore

Cooperating Units: None.

Man Years:

Total:	1.0
Professional:	0.5
Other:	0.5

Project Description:

Objective: To characterize the etiologic agent. To study the pathogenesis of the disease through experimental transmission studies. To recommend measures for the control and/or prevention of the disease in the NIH rabbit colony.

Methods Employed: Microbiology and pathology

Major Findings: The disease continued to occur endemically in the NIH rabbit colony. Study of the etiologic agent, Bacillus piliformis, was continued. A means was found to obtain large amounts of the vegetating organism free of spores, but the vegetative form was found to be very unstable outside the host cell (propagated in embryonated eggs) and it did not survive the usual methods of preserving microorganisms such as freezing and storage at -70 degrees centigrade or Lyophilization.

Significance: This disease is emerging as a common, often fatal, enteric infection of a variety of laboratory animals including mice, rats, hamsters, gerbils, rabbits, cats, and monkeys. The etiologic agent is a most unusual one whose collective characteristics have no equal in the field of microbiology and, consequently, is unclassified at present. Much of our present day information on the widespread occurrence of the disease in a variety of animal species was stimulated by our report of the disease in rabbits, this being the first record of the spontaneous occurrence of the disease in a species other than the mouse.

Proposed Course: Continuation.

Honors and Awards: By invitation, Dr. Ganaway presented a speech, "Tyzzer's Disease," as one of six contributors to the symposium "Disease of Laboratory Animals Complicating Biomedical Research," hosted by the American Society for Experimental Pathology at the Annual FASEB Meeting, Chicago, Illinois, April 13, 1971.

Publications: Ganaway, J.R., Allen, A.M., and Moore, T.D. Tyzzer's Disease of rabbits: Isolation and propagation of *Bacillus piliformis* (Tyzzer) in embryonated eggs. *Infection and Immunity*, 3:429-437, 1971.

Serial No. DRS-LAB-3
1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: PASTEURELLA IN GNOTOBIOTIC RATS

Previous Serial Number: DRS-LAB-4

Principal Investigators: Thomas D. Moore
Anton M. Allen
James R. Ganaway

Cooperating Units: Germfree Unit, RRPS

Man Years:

Total: 1.0
Professional: 0.3
Others: 0.7

Project Description:

Objective: To ascertain the role and incidence of P. pneumotropica in gnotobiotic, barrier-maintained rats free of respiratory illness. To determine the preferred location of this organism in experimentally inoculated germfree rats.

Methods Employed: Microbiology and Pathology

Major Findings: P. pneumotropica was isolated from the inflamed small intestine of inbred, gnotobiotic rats maintained in a closed barrier system. Further investigation and more extensive culturing showed the presence of this agent in all barrier room rats and mice as well as in a number of germfree isolators. An examination of healthy, female Sprague-Dawley rats from the barrier revealed that the organism had colonized the intestine with the caecum as the preferred site. The respiratory tract in these naturally infected rats was free of the organism while the uterus was culturally positive sporadically. These findings were generally confirmed in experimentally infected, germfree rats. In this latter case, occasional isolations were made from the trachea but definite colonization of the gut occurred with an increase of organisms with time. Again, isolations from the uterus were sporadic.

Significance: *P. pneumotropica* has been implicated as an etiologic agent in respiratory disease in mice and rats. The organism has been described as having an affinity for tissues of the respiratory tract although it has been isolated from brain, uteri, and spleen of mice. More recently, it has been isolated from eye abscesses in conventional mice here and in two other colonies. More information on the relationship and role of this organism in rodent disease is important.

Proposed Course: Continuation.

Honors and Awards: None.

Publications: A manuscript is being prepared.

Serial No. DRS-LAB-4
1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: PREGNANCY TOXEMIA OF GUINEA PIGS

Previous Serial Number: None.

Principal Investigator: James R. Ganaway

Other Investigators: Anton M. Allen

Cooperating Units: None.

Man Years:

Total:	0.2
Professional:	0.2
Others:	0.0

Project Description:

Objective: To further characterize the disease; to devise a more simple means of diagnosis than is presently available; to learn how to control or prevent the disease.

Methods Employed: Pathology

Major Findings: Obesity was found to be the predisposing factor of major concern. Guinea pigs bred when 900g. body weight suffered heavy losses (50 percent), then stresses late in pregnancy while those bred when 500g. body weight were unaffected by the same stress in late pregnancy. Urinalysis afforded a predictable aid to the early diagnosis of the disease which was evidenced by a sudden drop in the pH and the appearance of protein. The disease was further characterized by marked lipemia, acidosis, ketosis, and death. A similar syndrome was induced, but with lesser incidence, in obese nonpregnant guinea pigs and was compared to fasting ketosis.

Significance: Pregnancy toxemia is one of the major causes of maternal fetal wastage in guinea pig production colonies. The above findings indicate a need for regulating the diet of the guinea pig before and during pregnancy rather than the present *ad libitum* feeding practice.

Proposed Course: Completed

Honors and Awards: None.

Publications: Ganaway, J.R. and Allen, A.M. Obesity predisposes to pregnancy toxemia (ketosis) of guinea pigs. Lab. An. Sci., 21:40-44, 1971.

Serial No. DRS-LAB-5
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: GENETIC ANALYSES AND DEVELOPMENT OF NEW STRAINS FOR BIOMEDICAL RESEARCH

Previous Serial Number: None.

Principal Investigator: C. T. Hansen

Other Investigators: W. J. McEleney
W. J. Hinkle
P. Phillips

Cooperating Units: Laboratory of Bacterial Products, DBS
Poultry Research Branch, ARS, USDA, Beltsville, Maryland
Laboratory of Virology and Rickettsiology, DBS

Man Years:

Total:	1.0
Professional:	0.5
Others:	0.5

Project Description:

Objective: 1) To maximize the efficiency of the operation, 2) to ensure that the frequency of desirable characteristics of the inbred strains remain stable, and 3) to utilize the existing gene pool to develop superior models for biomedical research by selective breeding. The techniques used are necessarily those which are applicable to the particular project.

Methods Employed and Major Findings: Reproductive efficiency has been improved by determining in a broad way the dietary requirements of various inbred strains of mice and by changing the mating system used to produce these animals. The data obtained from these studies have been converted to automatic data processing procedures and preliminary statistical analyses have been completed.

Genetic monitoring procedures have been established. Data collected from these studies show that the age of onset of leukemia and mammary tumors in mice has remained stable over a long period. Blood pressure monitoring studies of various strains of rats have revealed considerable variation between strains and have detected additional hypertensive strains. A genetic analysis of hypertensiveness consisting of various strain combinations has been undertaken. The results of this analysis thus far indicate a complex mode of inheritance. These studies will be continued.

Strain development studies in mice, chickens, rabbits and dogs are underway. These studies essentially consist of developing strains characterized by a high and low frequency of a characteristic by selective breeding. Selective breeding for sensitivity and resistance to _B. pertussis_ has reached the tenth generation. Sensitivity has been increased from an initial value of 31 percent to 70 percent and resistance to 4 percent. This work is being done in cooperation with the Laboratory of Bacterial Products, Division of Biologics Standards. Work is underway to develop chicken stocks which are homozygous resistant and susceptible to leukosis virus. A resistant stock of birds has been developed and these birds will be used as a tester stock to develop a homozygous susceptible line. This work is being conducted in cooperation with the Poultry Research Branch, ARS, USDA, Beltsville, Maryland and the Laboratory of Virology and Rickettsiology, Division of Biologics Standards. Four lines of rabbits have been established, each of which is homozygous for a pair of genes which determine gamma globulin allotypes. Studies are underway to determine the interaction of these genes in producing the allotypes.

Significance: The significance of these projects is to develop, by the use of genetic techniques, animal models which have an application to biomedical research.

Proposed Course: Continuation.

Honors and Awards: None.

Publications: None.

Serial No. DRS-LAB-6
1. Laboratory Aids Branch
2. Animal Center Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: HEMATOLOGIC AND BACTERIOLOGIC CHARACTERISTICS OF STORED CANINE BLOOD

Previous Serial Number: None.

Principal Investigator: Stephen Potkay

Other Investigators: None.

Cooperating Units: None.

Man Years:

Total:	0.2
Professional:	0.1
Other:	0.1

Project Description:

Objective: 1) To determine the bacteriologic status of blood derived from dogs that are normal and healthy as judged by applicable standard clinical and laboratory criteria, and to evaluate methods of obtaining sterile blood. 2) To determine the influence of anticoagulants, storage time, storage temperatures, and storage containers on whole canine blood.

Methods Employed: Blood (450-500 ml) was collected into vacuum bottles containing heparin, ACD, or CPD as anticoagulants. Blood was stored for four days in heparin and for five weeks in ACD and CPD at three degrees centigrade. Determinations of the cellular components of the blood were made weekly and compared to values obtained from blood immediately after collection. Heparinized blood was examined daily. All blood was tested for sterility at the end of the periods.

Major Findings: Bacterial contamination of the blood did not occur in association with the collection procedures employed. Changes in cell populations in refrigerated canine blood appear to be minor. However, electrolyte shifts become pronounced with increased storage time. Morphology of the blood cells has not yet been examined.

Significance: The feasibility of supplying sterile blood from canine donors for use in research was demonstrated. Storage of heparinized blood for 24 hours and ACD blood for up to four weeks does not appear to reduce its usefulness for some research purposes, based on evaluations of cellular and electrolytic composition.

Proposed Course: Completed.

Honors and Awards: None.

Publications: A manuscript is being prepared.

Serial No. DRS-LAB-7
1. Laboratory Aids Branch
2. Animal Center Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: A COMPARISON OF PHYSICAL AND HEMATOLOGIC CHARACTERISTICS OF PUPPIES FED DIETS CONTAINING 9%, 8%, and 6% FAT

Previous Serial Number: None.

Principal Investigator: Stephen Potkay

Other Investigators: Joseph J. Knapka
Amos E. Palmer
Terry Pitts

Cooperating Units: Rodent and Rabbit Production Section

Man Years:

Total:	0.8
Professional:	0.2
Other:	0.6

Project Description:

Objective: To determine the relative values of feeds containing three levels of fat as diets for puppies during theweaning and growing periods.

Methods Employed: 1) Matings were scheduled so as to produce litters of genetic uniformity. 2) Thirty litters of pups (Foxhounds) were equally divided into three groups which were fed commercial dry diets containing 6 percent, 8 percent, and 9 percent fat, respectively. Dams were fed the same diets as their puppies beginning two weeks prior to parturition and continuing through weaning. 3) Supplemental feeding, which consisted of reconstituted canned milk, was provided uniformly for puppies to expedite weaning. The dry feeds were provided *ad libitum* for all bitches and their litters. 4) Evaluations consisted of examining and weighing each bitch weekly through weaning and each puppy weekly until 20 weeks of age. Measurement of hematologic values was done by standard methods, samples were obtained weekly from three randomly selected puppies from each litter and from their dam.

Major Findings: The number of litters produced in his study is currently too small to permit meaningful comparisons. However, data obtained from one litter receiving the 9 percent fat diet and two litters fed the diet containing 8 percent fat suggest that the former is markedly superior.

Significance: The majority of commercially available diets are in compliance with the minimum nutritional requirements for dogs as stated by the National Research Council, Committee on Animal Nutrition. However, these diets differ markedly in providing usable or digestable nutritives to puppies. The differences are evident from observations of general physical condition, weight gain, andhematologic values of dogs given these feeds. Future selection of diets for growing puppies will be based in part on the information concerning dietary fat content which is derived from his study.

Proposed Course: Continue until 27 litters have been studied.

Honors and Awards: None.

Publications: None.

Serial No. DRS-LAB-8
1. Laboratory Aids Branch
2. Animal Center Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1970, through June 30, 1971

Project Title: EFFECTS OF CHLORAMPHENICOL ON BARBITURATE AND HALOTHANE ANESTHESIA IN RHESUS MONKEYS (MACACA MULATTA)

Previous Serial Number: None.

Principal Investigator: Stephen Potkay

Other Investigators: Amos E. Palmer

Man Years:

Total:	0.3
Professional:	0.2
Others:	0.1

Project Description:

Objective: To determine whether oxybarbiturate anesthesia is prolonged following chloramphenicol administration in rhesus monkeys and to ascertain the effects of chloramphenicol administration on thiobarbiturate and halothane anesthesia.

Methods Employed: Four groups of monkeys, each containing six males and six females, were used. In Groups 1 and 2 the effects of chloramphenicol administered intravenously (IV) and intramuscularly (IM) immediately prior to induction of anesthesia with an oxybarbiturate (pentobarbital sodium) were studied. Monkeys in Group 3 were anesthetized with a thiobarbiturate (thiamylal sodium) immediately prior to administration of chloramphenicol IM. Chloramphyenicol was given immediately prior to thiamylal induced anesthesia in Group 4 monkeys. Anesthesia was maintained in his group for one hour using halothane. Recovery times were calculated as the lapsed time between administration of the anesthetic and the time at which the monkey could stand without support. Data were anlayzed by standard methods.

Major Findings: Recovery from pentobarbital anesthesia was prolonged in monkeys that received chloramphenicol IM or IV. The duration of anesthesia was not affected by chloramphenicol administration in monkeys anesthetized with thiamylal or halothane.

Significance: Since it is generally desirable that monkeys become ambulatory as soon as possible following anesthesia, combined administration of chloramphenicol and pentobarbital should be avoided. Rapid recovery of monkeys from thiamylalhalothane anesthesia, regardless of whether chloramphenicol is or is not administered concurrently, indicates the suitability of these agents over pentobarbital for anesthesia in monkeys.

Proposed Course: Completed.

Honors and Awards: None.

Publications: A manuscript has been prepared.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1970, through June 30, 1971

LIBRARY BRANCH Seymour I. Taine, Chief

I. SUMMARY

A new Library Services Adviser program was implemented to broaden services offered by the Library in an integrated bibliographic and reference effort.

Effective measures to improve communications were initiated throughout the Branch. Some significant organizational and personnel changes have been beneficial for Library operations. Planned physical alterations of the Lower Level have now been completed. The photocopy service was relocated in quarters adapted for more effective operations. The Reading Room has been enlarged, lighted well, and attractively furnished. Relocation of the Acquisitions Unit has consolidated technical services on the Upper Level.

The Library Advisory Committee continued to assist and support the programs of the NIH Library.

The case of Williams and Wilkins Company continues against the Government relating to the photocopy service and copyright law. Mr. Taine, Chief, Library Branch, appeared as one of the witnesses for the Government at the trial held September 9-14.

A decision will be made by the Department of Labor for DHEW regarding the validity of the composition of the bargaining unit at the time of the election on October 14, 1969. The election resulted in Local 2419 American Federation of Government Employees AFL-CIO being awarded exclusive recognition to represent all non-supervisory NIH Library employees. The NIH and the DHEW have now raised the question of the appropriateness of including professional personnel in the unit.

The 3M TATTLE-TAPE Security System selected for installation in July has been in operation during the year to control proper charging and reduce loss of Library books and journals.

Two Library Consultants to the NIH Library were appointed to advise the Branch Chief in the areas of Library automation and scope and coverage of the Library collection. A draft of an overall policy governing scope and coverage and of the Reference Collection are in preparation.

The FY 1971 Branch Training program emphasized in-house seminars and lectures for employees of all levels. It was designed to meet the needs of all Library personnel and was developed on a group basis through group chairmen and committees for close interaction. Career and job counseling were provided nonprofessional employees. A pilot training course was developed for two selected Library Technicians from the Reference Unit which led to their passing the difficult Civil Service Commission's subject matter test in library science and their transfer into the professional Librarian series.

An IBM study of Library operations has as its purpose the identification of an existing automated Library system which would meet the needs of the NIH Library. DCRT's WYLBUR System was implemented in the Acquisitions Unit's ordering procedures after a detailed experimental study of its feasibility. The Library's journal control procedures are under review relative to the feasibility of adaptation of PHILSOM System developed by Washington University School of Medicine Library.

II. BRANCH PROGRAMS

A. Objectives

The primary mission of the Library Branch is to operate an efficient, comprehensive library in support of NIH scientific, medical, and administrative programs. Activities of the Library include selection, acquisition, organization, maintenance, and circulation of literature pertinent to the programs; operation of a photocopy service; provision of informational, reference, and bibliographical services; provision of Library services advisory assistance; and provision of a translating service for foreign scientific and medical literature. To fulfill its mission, the Library is responsive to changing literature needs of the NIH investigators, is knowledgeable of current developments in manual and machine methods of communication and information retrieval, and is alert to adjustment of procedures for improved Library services.

B. Current Programs

Readers Services

The Circulation staff provides a charging system making available books and journals which may be borrowed. They issue Library Identification Cards and Pagemasters and make assignments to locked carrels.

The Interlibrary Loan staff obtains from other libraries, through interlibrary loan, literature required by NIH investigators which is not included in the collection.

The Stacks Maintenance staff maintains the library materials to facilitate access by the Library clientele.

The Duplication and Audiovisual staff provides a Library Copy Service allowing greater use of the Library's journals and an audiovisual service giving access to biomedical literature available as microfilm, microcard, and microfiche.

Translating Service

The Translation Unit provides oral, recorded and written translations as requested. Oral translations are emphasized in-house, and written translations are made for the most part by contractual firms.

Reference and Bibliographic Services

The Library Services Adviser program provides as a new experimental service an integrated response to the information needs of the NIH scientific community. This may consist of utilization of substantial external resources beyond the resources available in the NIH Library, such as specialized information centers, computerized information retrieval systems, and clearinghouses.

The Reference staff supplies ready response to questions, verifies citations, and compiles short reference lists. They man the Reference Desks in the Reading Rooms on the Upper and Lower Levels.

Senior Reference Librarians answer difficult reference questions and compile literature searches as requested. They serve as selectors for Library acquisitions by continually searching journals, publishers' catalogs and announcements for literature pertinent to the scope of the Library.

Bibliographic Services staff provides bibliographic assistance with experienced searchers to formulate requests for MEDLARS computer searches at the National Library of Medicine.

Technical Services

The Acquisitions staff provides for the acquisition of books, journals, technical reports, and microform materials by purchase, gift, and exchange which are pertinent to the scope of the Library. The staff is responsible for the maintenance of the Periodical Record, preparation of completed journals for commercial binding, and for the annual issuance of Current and Noncurrent Journals in the NIH Library. Various procedures have been automated, and selected output is obtained from the NIH computer.

The Cataloging staff organizes the acquired literature through classification, cataloging and subject heading, and processes it for inclusion in the collection. The staff is responsible for the maintenance of the catalog and the issuance of The NIH Booklist. As in Acquisitions, certain procedures have been automated for selected output from the computer.

C. Program Progress and Accomplishments

The Library underwent considerable physical alteration on the Lower Level which resulted in relocation for several units; additional reading area, permanent secondary abstract and index collection, and improved lighting, noise control and attractiveness were provided. The Acquisitions Unit was moved to the Upper Level adjacent to the Cataloging Unit consolidating the activities of the Technical Services Section. The Library Copy Service was relocated in quarters having improved air conditioning, noise control and size to accommodate an additional 720 Copier, microfilm processor, and an ample public access area for handling requests. The Audiovisual Room was relocated adjacent to the Library Copy Service. The new Reading Room provides a much needed study area on the Lower Level for Library users.

The 3M TATTLE-TAPE Security System had been in operation during the year to control loss of Library books and journals.

The Department of Labor has been asked by DHEW to make a ruling regarding the validity of the composition of the bargaining unit at the time of the election on October 14, 1969, which resulted in Local 2419 American

Federation of Government Employees AFL-CIO being awarded exclusive recognition within the NIH Library. The question raised by DRS and NIH concerns whether professional librarians and technical information specialists were incorrectly included in the bargaining unit.

Two Library Consultants to the NIH Library were appointed to advise with Mr. Taine in the areas of Library automation and scope and coverage of the Library collection. Dr. Estelle Brodman, Librarian at Washington University School of Medicine, St. Louis, Missouri, visited the Library in January to study the Library's Reference collection and the overall scope and coverage of the Library collection from the methodological point of view. Mr. Glyn T. Evans, Deputy Librarian of Washington University, visited the Library several times for discussions on automated serials control systems.

Effective March 4, the Director, DRS, approved the proposal to reorganize parts of the Library Branch. The Translation Unit was moved from the Readers Services Section to the Office of the Chief and the Library Copy Service from the Office of the Chief to the Readers Services Section. The Readers Services Section is now composed of four Units: Circulation Unit, Interlibrary Loan Unit, Stacks Maintenance Unit, and Duplication and Audiovisual Unit (the former Library Copy Service).

Eight staff members participated in the DRS Second Annual Equal Employment Opportunity Seminar held September 15-16. Action items selected as pertinent for the Branch included individual career counseling, training, clarification of the Merit Promotion Policy, and communications. Staff members served on the NIH EEO Council and the DRS Director's Advisory Committee on EEO matters.

In compliance with the EEO Seminar suggestion for improving communications full Branch staff meetings in the form of "town meetings" were inaugurated on a quarterly basis with staff participation in discussions and questions on topics of common interest. Other full staff meetings have been held at intervals for discussions of special subjects, such as EEO and Merit Promotion Policy. After Library staff conferences, meetings are held within each Section and the Office of the Chief for conveying to the staff the matters discussed.

The supervisor of Stacks Maintenance was selected as the Library Branch Trainee (Administrative) in the Acquisitions Unit and entered upon a year-long program. He was enrolled for full-time study at the Federal City College in September at government expense. During the college year, he worked 16 hours weekly in the Acquisitions Unit and full-time during the summer and college holiday periods.

The FY 1971 Branch Training program represented a substantial increase in effort, time, and participation in order to achieve employee satisfaction, sociological objectives and direct benefits to the Branch operations. A Training Program designed to meet the needs of all Library personnel was developed on a group basis;Group I professionals, Group II GS-5 and 6's, Group III GS-1 - 4's, through group chairmen and committees for close interaction within each group. Group I elected attendance at NIH lectures and pertinent in-Library seminars with an option on enrolling in a formal course. Group II selected two subjects, Reference Tools and Library Searching and Cataloging Procedures, to be presented as informal courses by Librarians on the staff. Group III chose a series of lectures and site visits presented by supervisors of principal Library operations. The three group chairmen with the Assistant Chief, LB, Training Program Coordinator, prepared detailed plans and administered the program. Three formal courses were taken by individuals in the professional group.

As part of its Training Program the Branch set up a special pilot training course for two employees which was designed to supplement the practical knowledge they had gained on the job. Two Library Technicians in the Reference Unit were selected for the training. Instruction Courses covering the essentials of 10 major library specialties were developed by Librarians on the staff. They passed the difficult Civil Service Commission's subject matter test in library science and have now entered a professional career through their resultant transfer from the Library Technician GS 1411 series to the GS 1410 Librarian Series.

A Technical Information Specialist completed the 4-month MEDLARS training at the National Library of Medicine in order to function as a MEDLARS formulator for NIH requests for computerized bibliographies.

A three-man job counseling team from the Library and the Division was set up to meet the needs of the nonprofessional staff who desired job counseling. Interviews were held and individual recommendations made for each person interviewed. Discussions were held with supervisors and the Chief, LB, concerning practical possibilities prior to informing those interviewed of recommendations for possibilities and alternatives open to them for training or further counseling.

Exhibits displayed by the Library during the year featured Services of the NIH Library, Dr. Julius Axelrod as Nobel Prize recipient, History of Medicine (an NLM Exhibit), MEDLARS Services of the NIH Library, Library Services Adviser Program (a new NIH Library service) and Dr. David Shakow.

Readers Services

As a result of organizational changes, the Translation services were transferred to the Office of the Chief, and the Library Copy Service, renamed Duplication and Audiovisual Unit, was moved into Readers Services. This Section is now composed of four units.

Circulation. A new loan period for NIH Library literature was introduced on July 1. Circulating books and journals (Copy 2) with the exception of books more than 2 years old are now due for return to the Library in 2 weeks. Older books may be borrowed for a 4-week period.

A concentrated effort was made to clear the Circulation Desk charges of books and journals overdue by June 30, 1970, which were charged out before the change of the loan period. Of a total of more than 1000 volumes at the start of the project, 122 volumes remained unaccounted for, and of this number 34 volumes were charged to persons no longer at NIH. In the spring of 1971 a second project was initiated to clear the charges of volumes overdue between July 1 and November 30, 1970. At the same time current overdues are being processed to bring the files up to date.

Design of a plastic embossed ID Card used to obtain library services was correlated with the design of a new Library request form scheduled for use early next fiscal year.

The move to the new enlarged quarters in October contributed to more efficient coordination of operations, faster service with the addition of a second 720 machine and a microfilm processor, and improved work environment.

Technical Services

The Section Chief completed a study project relating to procedures and costs involved in NLM classification and subject heading conversion.

Acquisitions. Implementation of DCRT's WYLBUR System applied to the Acquisitions Unit's ordering procedures was initiated on March 1. Information gained from a detailed experimental study of the system's application to various Library activities was considered in determining its feasibility and contribution to operations efficiency.

Procedures relating to journal control have been under review to determine the feasibility and benefits of adaptation of the PHILSOM System of journal control developed by the Washington University School of Medicine Library.

Cataloging. Several reclassification projects were undertaken to improve the ease of use of the collection by the Library clientele. Reclassification of subject bibliographies was initiated so that bibliographies on a subject will be located on the shelf with books on that subject.

A reclassification project was started to conform to a Library policy change which standardized the treatment of the annual review type of publication. Decision was made to consider such annuals as journals and not as monographs.

Reference and Bibliographic Services Section

The implementation of the Library Services Adviser program at the end of March represents a major development in broadening the services offered by the Section and in integrating the bibliographic and reference effort. The layout of the Section was revamped to meet the needs of the users of the services. Two Library staff members selected through Merit Promotion procedures were reassigned as the Section receptionist and as a junior professional subject assistant for all Section activities.

Three Library Services Adviser trainees selected through Merit Promotion procedures received 6 months' preparation for the new experimental program. Visits were made to area clearinghouses, libraries, and specialized information centers to observe operations and become acquainted with special subject collections. Meetings and seminars were attended to gain information on major computerized scientific information retrieval systems. Information and resource files were organized to be used for referrals to NIH requesters for subjects outside the Library's scope and coverage. Experimental interviews were held with several NIH scientists, and responses were developed to meet their needs. Final decisions were made concerning policy, procedures and documentation methods, and meetings were held with the staff of each Section activity so that all functions would be integrated into an efficient operating program.

D. Problems

The need for qualified professional staff remains as the primary problem. Some improvement in this area has been made possible through reassignments and organizational modification.

E. Program Plans

A further stage in Library automation is expected to have implications with regard to a coordinated computerized system for procedural operations. A general in-house training program is expected to provide subprofessional personnel capable of performance at higher levels with complete responsibility for certain Library operations. A scope and coverage policy is under development which will bring increased pertinency of the literature acquired for the Library's collection to the NIH research program.

F. Publications

National Institutes of Health Library: Current and Noncurrent Journals in the NIH Library 1971. (Internal Use only) National Institutes of Health Library: NIH Library Booklist. Monthly. (Internal Use only)

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1970, through June 30, 1971

MEDICAL ARTS & PHOTOGRAPHY BRANCH Mr. Arthur F. Moore, Chief

1. SUMMARY

During FY 1971, the Medical Arts & Photography Branch streamlined work methods and instituted new and improved technology, such as Motion Picture equipment that made coverage of a wider variety of surgical procedures possible, a computer graphics service capable of large scale production, equipment and expertise that delivers higher quality and more diversified service in scientific photography and several new art mediums. Also, in-house cross-training has led to a more widely diversified staff, better use of staff capacity, development of new skills and career ladders, and improved morale. These improvements, coupled with a substantial increase in outside contract services, have added quality, quantity, and speed of production in the Branch.

A contract was signed binding the Branch and the American Federation of Government Employees to a two-year working agreement. All managers were provided one or more opportunities for training to improve the labor management of the Branch.

II. BRANCH PROGRAMS

A. Objectives

The objective of the Branch is to provide consultation and production services to the NIH; to visually communicate program effort and research results; to provide knowledge, skills and techniques in visual design, medical art, applied arts, still photography and cinematography for solving problems of recording, communicating and presenting research activity; and to investigate, develop and apply new visual techniques.

It is also the objective of the Branch in meeting NIH research program needs, to provide in-house services on a professional basis, competitive with commercially obtainable services at the lowest possible cost, and to develop specialized capabilities, particularly in graphic presentation, still photography, cinematography, and medical arts, tailored to NIH needs.

The Branch monitors procurement of art and photography services by outside contract, serving as technical adviser in obtaining needed additional services at the lowest cost consistent with high quality.

B. Current Programs

Programs of the Branch are still and motion picture photography, including photomacrography, photomicrography, high-speed cinematography, general photography, and related laboratory services; visual arts production including publications design and general graphics; visual aids including slides, vu-graphs, and other projectables; animation art work; technical, general and medical illustration; exhibit design; statistical drafting, display charts; medical models; and computer-generated graphics.

C. Program Progress and Accomplishments

1. Operational Improvements

Much effort was directed toward utilizing computer produced charts and graphs. Successful experimental programs resulted in a computer graphics program. Line and letter quality was improved. Several computer programs now exist for routine large-scale production. Graphs produced on the DCRT Cal-Comp Plotter have been tested and meet the standards for biomedical journal publications.

A new maximum elevation, highly mobile Motion Picture camera stand was developed which has significantly increased the ability to cover a wider variety of surgical procedures. Modern up-to-date equipment has been added to the Photomacrography area which delivers a higher quality and more diversified service in scientific photography.

A new highly versatile multi-colored light sensitive material has become a major art medium in the Branch. It provides a shortcut for the artist in executing ideas quickly. A transparent dye is now used that quickly transforms single color posters to two colors.

2. Work Reception

Most of the work done by MAPB for the NIH researcher is of a custom nature. This necessitates the researcher to be put in immediate, direct contact with the person or persons doing his work. The central branch-wide work reception area was elminated as a cumbersome step seriously hindering optimum communication and production. As a result, all work produced by the nine separate Units of MAPB is now directly received and delivered by those Units. This change has received enthusiastic approval by all concerned.

3. Service Contracts

With the cutback in personnel and the increase in requests for color photographic and art services over the past year, over $60,000 in contracted work was handled by MAPB. The increased use of contractual services in FY 1971 justified a full-time position to handle this function.

4. EEO Developments

Progress toward Equal Employment Opportunity goals continued.

a. Branch-wide meetings were scheduled on a quarterly basis.

b. Employee reviews were begun in order to identify career goals, previous training, qualifications, and accuracy of position descriptions.

c. Discussions were held with first-line supervisors to emphasize the importance of their roles in the EEO program.

d. Meetings with each Section were scheduled with the Division EEO counselor to provide meaningful exhanges of information with supervisors.

5. Photo Service Switched to Revolving Fund

The results of a study on the feasibility of placing still photo services on the NIH Revolving Fund indicated the change would be beneficial to the Institutes and the Branch. The transfer was completed April 1, 1971, with no interruption in service.

6. Presidential Memo on reduction of spending on public information activities

The OMB reduction of public information funds has cut deeply into certain NIH publication, audiovisual and exhibit programs. However, there remains a real demand to publicize the NIH biomedical research findings to the scientific community. The trend in the exhibit program, as an example, has been toward lighter weight, more easily transported exhibits rather than expensive exhibits with elaborate assembling, dismantling, and transporting problems.

7. Labor Relations

A two-year labor management negotiated agreement between the Medical Arts & Photography Branch and the American Federation of Government Employees was completed and approved by DHEW. The negotiations were conducted in an efficient and cooperative manner. All nine of the Branch supervisors attended the in-depth Civil Service Commission Labor Management Course, "Supervisors and the Negotiated Agreement." This highly effective training and MAPB management cooperation will help insure smooth labor relations for the duration of the contract.

8. Training

A series of meetings conducted by a member of the DRS personnel staff and the Branch Administrative Officer were held with all members of the Branch to thoroughly orient each employee with the workings of the Merit Promotion Plan.

Twenty-four members of the Branch received formal technical training in FY 1971.

D. Problems

Inconvenient layout, poor air circulation, and general decay of the plumbing and electrical systems prompted the decision to renovate the photo laboratory area. An architectural firm specializing in photo laboratory designs has been engaged. Initial discussions and layout have been completed. Further discussions are planned prior to construction drawings.

E. Program Plans

As the Branch gains acceptance from the scientific community in the use of computer graphics, significant changes will occur in the drafting program and increase MAPB's capability to produce higher volumes in this type of work with existing personnel.

It is expected that the volume of contracted work will increase in the future. The use of contracts has been a valuable aid and the continued availability of these services is considered vital to allow the Branch to respond to the many emergency requests which otherwise could not be handled.

A three-color Branch brochure was designed. The purpose of the brochure is to acquaint the NIH researcher with visual services provided by the Medical Arts & Photography Branch in the documentation of medical findings. It will be distributed early in FY 1972.

F. Publications

Bartner, H. C., Paton, D.: An improved model for instruction in binocular indirect ophthalmology. Journal Archives of Ophthalmology. May 1971.

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